FINANCIAL LITERACY AND CRYPTOCURRENCY PARTICIPATION

EMRE DEMİRCİ

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FINANCIAL LITERACY AND CRYPTOCURRENCY PARTICIPATION

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Emre Demirci

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DECLARATION OF ORIGINALITY

I, Emre Demirci, certify that

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- this thesis contains no material that has been submitted or accepted for a degree or diploma in any other educational institution;
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Date 12.02.2021

ABSTRACT

Financial Literacy and Cryptocurrency Participation

After the circulation of first bitcoin and following numerous blockchain based cryptocurrencies, they have gained popularity in recent years. Moreover, they have been considered as breakthrough financial instruments enabling low transfer cost, anonymity and lack of central control. Beyond the conventional financial products and services, cryptocurrencies rely on a different technological infrastructure. This research aims to investigate the relationship between cryptocurrency participation and financial literacy including knowledge of both conventional financial instruments and cryptocurrencies. In this study, the work of van Rooji, Lusardi and Alessie (2011) regarding financial literacy and stock market participation was extended and different question sets were designed to measure financial literacy and cryptocurrency literacy levels. Furthermore, in order to ensure robustness, financial literacy and cryptocurrency literacy levels were analyzed in terms of different cryptocurrency participation types which are historical ownership, performing cryptocurrency mining or minting, current ownership and future ownership intention. The data is collected from 330 respondents through an online survey and the findings present that there is a relation between financial literacy and cryptocurrency participation as financial literacy levels increase, participation also increases. Similarly, there is a strong relationship between cryptocurrency literacy and cryptocurrency participation. The results and implications obtained from this research will be of considerable interest to service, platform and crypto asset providers in cryptocurrency ecosystem in terms of enhancement of the market.

ÖZET

Finansal Okuryazarlık ve Kripto Para Ekosistemine Katılım

İlk Bitcoin'in dolaşıma girmesinin ve Bitcoin'i takip eden çok sayıda blok zinciri tabanlı kripto paranın ortaya çıkmasının ardından kripto paralar son yıllarda popülerlik kazanmıştır. Üstelik, kripto paralar düşük transfer maliyetine, anonimliğe ve merkezi kontrolün elimine edilmesine imkan veren çığır açan finansal araçlar olarak değerlendirilmiştir. Geleneksel finansal ürün ve hizmetlerin ötesinde kripto paralar, farklı bir teknolojik altyapıya dayanır. Bu araştırma, hem geleneksel finansal araçlar hem de kripto para bilgisini içeren finansal okuryazarlık ile kripto para ekosistemine katılım arasındaki ilişkiyi incelemeyi amaçlamaktadır. Çalışmada, van Rooji, Lusardi ve Alessie'nin (2011) finansal okuryazarlık ve hisse senedi piyasasına katılımı konu alan çalışması geliştirilmiş ve finansal okuryazarlık ile kripto para okuryazarlık seviyelerini ölçmek amacıyla farklı soru setleri tasarlanmıştır. Katılımcıların finansal okuryazarlık ve kripto para okuryazarlık seviyeleri tarihsel sahiplik, kripto para madenciliği yapma, güncel sahiplik ve gelecekte sahip olma niyeti gibi farklı kripto para katılım yöntemleri açısından analiz edilmiştir. Çevrimiçi anket yoluyla 330 katılımcıdan veri toplanmıştır. Elde edilen bulgular, finansal okuryazarlık ile kripto para piyasasına katılım arasında bir ilişki olduğunu ve finansal okuryazarlık seviyeleri arttıkça, katılımın da arttığını ortaya koymuştur. Benzer şekilde, kripto para okuryazarlığı ile kripto para ekosistemine katılım arasında güçlü bir ilişki olduğu görülmüştür. Bu araştırmadan elde edilen sonuçların ve çıkarımların, piyasanın geliştirilmesi açısından kripto para ekosistemindeki kripto varlık, hizmet ve platform sağlayıcıları için dikkate değer oldukları değerlendirilmektedir.

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CHAPTER 1

INTRODUCTION

Conventional electronic payment systems need trusted third parties giving guarantee both sides regarding legitimacy and provability of transfers. This mediation role brings transfer costs and on the other hand, transactions are not absolutely non-reversible.

Nakamoto (2008) in his path-breaking article proposes a way that eliminates the need for trusted third parties in transfers and transactions in payments through a system based upon cryptographic proof in substitution for trust mechanism. In this way, not only users are able to make unmediated transfers, but also reverse transactions are impracticable via peer-to-peer distributed timestamp server using Proof of Work system.

Kehoe, Dalton, Leonowicz, and Jankovich (2015) discuss the characteristics and potential of blockchain technology enabling cryptocurrencies to be used as an alternative in transforming traditional financial ecosystem. As distributed, unalterable, digitalized and freestanding from any state or central authority, blockchain infrastructure enables reducing (i) transaction and fixed costs, (ii) risk of duplicated, deleted or reversed transactions and (iii) fraud. Blockchain structure, with its collective bookkeeping characteristic as a shared public ledger, also ensures a shared single source of trust in peer-to-peer network without allowing total control of anyone, which cuts the need of reliance on a trusted intermediary.

Because of this feature initially it was regarded as a threat for banks and financial institutions which carry the role of trusted middle man. However, financial institutions have realized its potential and have started to explore ways to use it in their operations. Yet, blockchain still is a challenge for banks and financial institutions and it is seen as

the reason for disappearance of lots of functions and jobs in finance sector in following years (Vandepitte, 2017).

Cryptocurrencies making benefit of the decentralized characteristic of blockchain system are secured by strong cryptography, which enables secure transaction records.

Hu, McInish, Miller, and Zeng (2019) stated that while fiat currencies are open to be intervened and manipulated by central authorities, cryptocurrencies are independent from central authorities and transactions are recorded in irreversible distributed ledgers. Accordingly, being detached from any country also mitigates collapse or inflation risk because of being linked to a certain currency, on the other hand, it also brings a complication for governments in establishing and executing monetary policies.

One of the distinguishing characteristics of cryptocurrencies from conventional ones is that cryptocurrencies enable anonymity for users thanks to their working mechanism which does not necessitate users to prove real identities. While some of the service providers require ID verification of consumers for KYC (Know Your Customer) and AML (Anti Money Laundering) because of the regulations of states where service providers locate, still users may create anonymous accounts without entering any identifying information in some of the service providers. On the other hand, cryptocurrency mechanism allows people to create multiple accounts at even same service provider, let alone different service providers. Therefore, it brings difficulty to deduce total number of cryptocurrency users (Rauchs et al., 2019).

However, through using surveys, analyzing studies and data from service providers, Rauchs et al. (2019) make some estimations that especially in some of the developed countries between 2% to 9% of the population have cryptocurrencies. They

project that at least 35 million ID-verified unique users have accounts all over the world and together with ID-verified users, it is estimated that more than 139 million accounts have been created by cryptocurrency users by 2018.

Cryptocurrencies as new financial instruments different from conventional ones have taken attention of people all over the world and gained popularity. Figure 1 shows that by 2013, in the fifth year after the inception of first cryptocurrency, Bitcoin, there were 66 different cryptocurrencies in circulation. In 2017, just before the highest market value performed, the number of cryptocurrencies reached 1335.

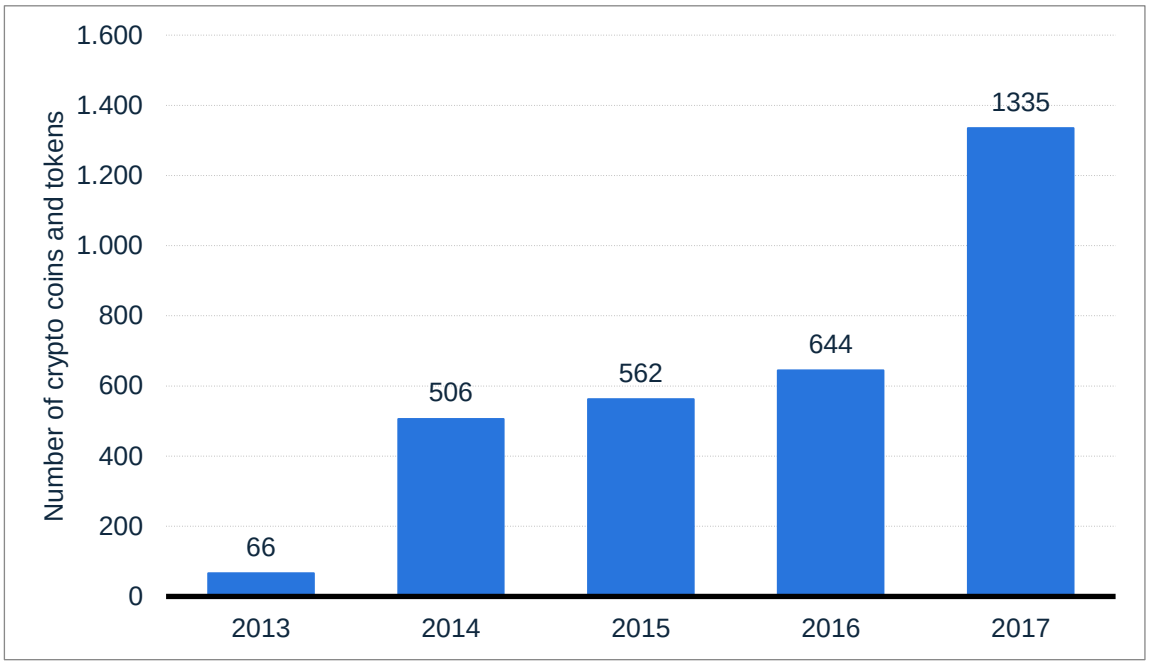

Figure 1. Cryptocurrency numbers globally 2013-3017

Source: https://www.statista.com/statistics/863917/number-crypto-coins-tokens/

Together with this extraordinary performance and public interest, so many new cryptocurrencies have emerged and the number of cryptocurrencies in circulation reached to 3009 by June 2020 and to 4373 by the end of 2020 (investing.com, 2020).

In a short span of time, they have gained ground in finance ecosystem and the market cap of cryptocurrencies have reached around 10.6 billion US Dollar at the end of 2013. Figure 2 exhibits that after fluctuations the market cap reached 17.7 billion US Dollar at the end of 2016 before starting its substantial growth. In 2017 cryptocurrency market cap showed an astronomical increase through rising to 566.2 billion US Dollar by year-end which was 33 times of previous year. Thereafter highest value observed from the beginning of cryptocurrencies, in 2018 market capitalization decreased to 128.7 billion US Dollar. As from 2018, cryptocurrency market cap again has showed a tendency to increase such that it has reached to 237.1 billion US Dollar by the end of 2019 and with a massive increase it has reached to 758.06 billion US Dollar at the end of 2020.

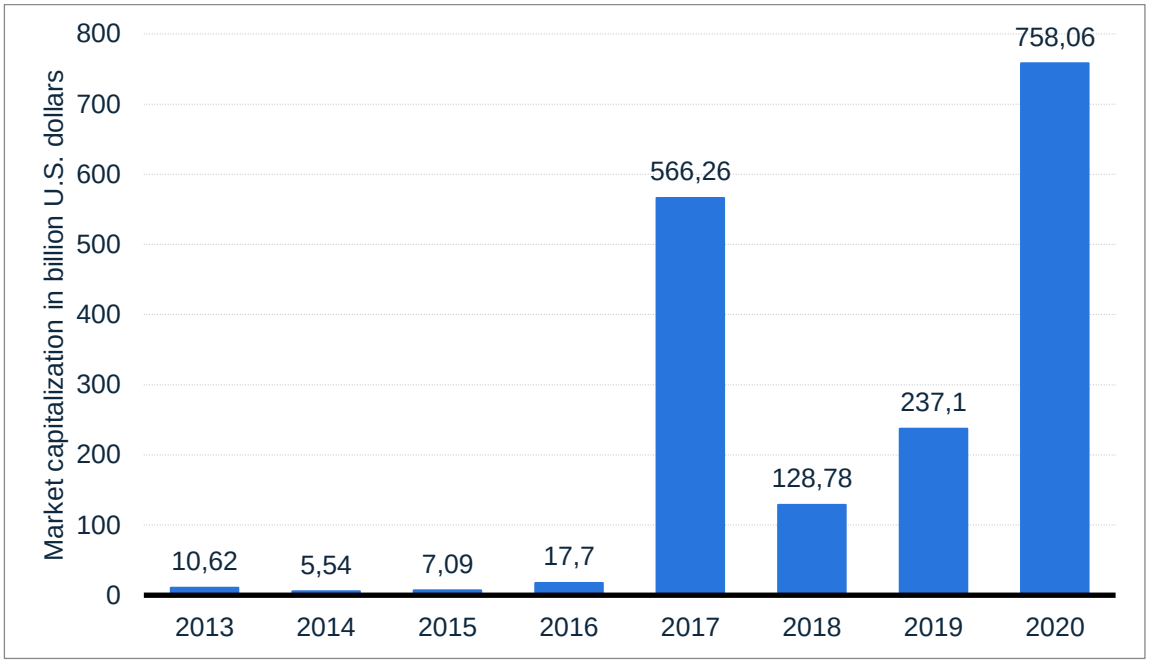

Figure 2. Year-end values of cryptocurrency market cap between 2013 and 2020

Source: https://www.statista.com/statistics/730876/cryptocurrency-maket-value/

Figure 3 exhibits linear movement of cryptocurrency market cap for between 2017 and 2020. As a result of substantial increase during 2017, market cap reaches to the highest point in its short historical adventure as 833.4 billion US Dollar in January 2018. After that point, total market cap shows severe fluctuations and by July 2020 it is appeared around 260 billion US Dollar. At the end of 2020 total market capitalization exceeds 750 billion USD level.

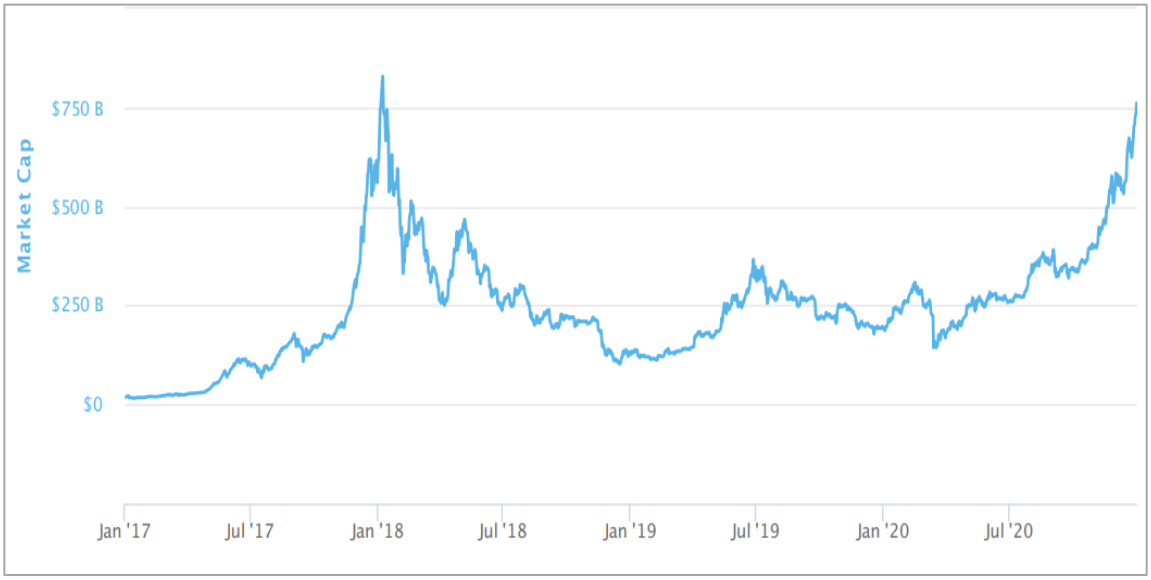

Figure 3. Linear scale market capitalization of cryptocurrencies

Source: https://coinmarketcap.com/charts/

The fluctuation in the market capitalization results from the connectedness of cryptocurrencies. Yi, Xu, and Wang (2018) found that cryptocurrencies fluctuate together and cryptocurrencies with higher market capitalization result in higher volatility in the market. Moreover, these fluctuating cryptocurrencies trigger other small market cap cryptocurrencies as well.

Bitcoin, the pioneer of the cryptocurrencies, leads all other cryptocurrencies and in general term, market cap is shaped by mostly Bitcoin value. From emergence of

cryptocurrencies until mid-2017, Bitcoin dominated the market with 80%. In 2017 market was dominated by mainly Ethereum with 31% and Bitcoin with 37%. After reaching its lowest level as 32% in 2018, Bitcoin still represents around 60% of the market cap (Figure 4).

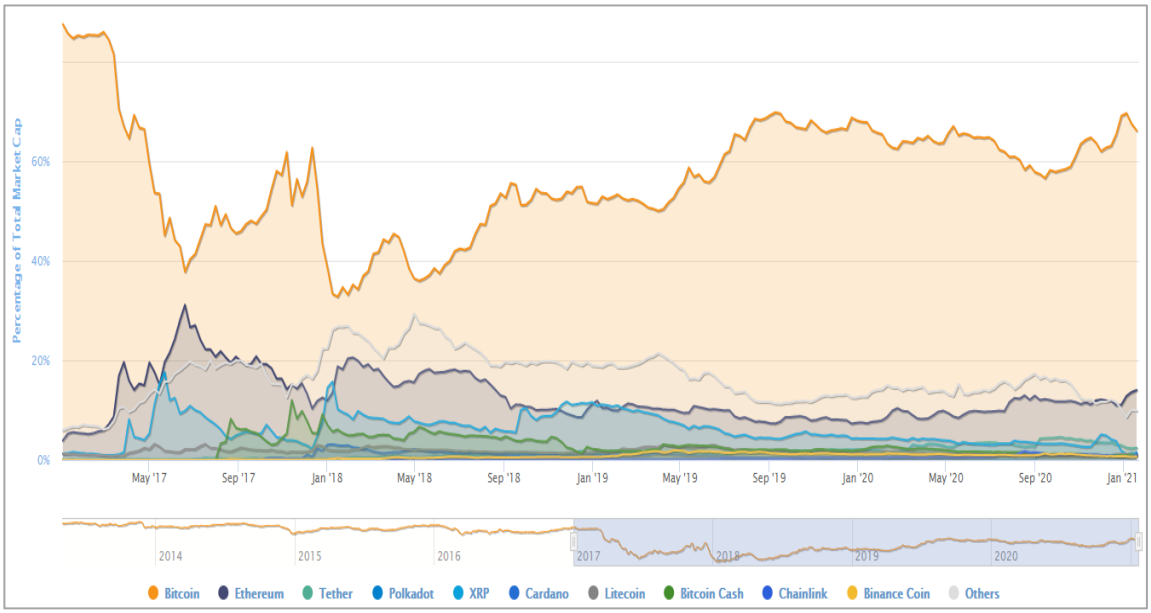

Figure 4. Percentage of total market capitalization

Source: https://coinmarketcap.com/charts/#dominance-percentage

As a natural consequence of Bitcoin dominance in the market, Bitcoin prices and total market capitalization show similar movements in graphs. Figure 5 shows that in the same period, between December 2017 and January 2018, when market cap displayed best performance, Bitcoin value has showed rapid increase as well. After that point, Bitcoin still has become determinant cryptocurrency shaping total market capitalization and by January 2021 it has reached its highest historical value with more than 40,000 USD.

Figure 5. Bitcoin prices in terms of US dollar

Source: https://www.investing.com/crypto/bitcoin/chart

Due to being freestanding from any central authority and lack of rules regulating cryptocurrency price formation, cryptocurrency prices are determined in market conditions and therefore cryptocurrencies experience severe price fluctuations. This situation causes uncertainty, risk of losses and fraud thread in terms of investors. Knowledge about financial markets, investment instruments and cryptocurrency ecosystem is crucial for investors while taking the decision of participating cryptocurrency ecosystem. In this regard, this study aims to research and analyze financial literacy levels of people and the effect of financial literacy in cryptocurrency participation

Financial literacy defined as “a combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately

achieve individual financial well-being" in the report published by OECD is deterministic in financial behavior of individuals (OECD, 2017).

Figure 6 exhibits average financial literacy scores over 21 point, according to individuals' financial instrument usage in some G20 countries and shows that people using payment products have higher financial literacy scores compared to non-user people. Same as payment product usage, individuals benefitting savings instruments have higher scores compared to people who do not hold savings instruments.

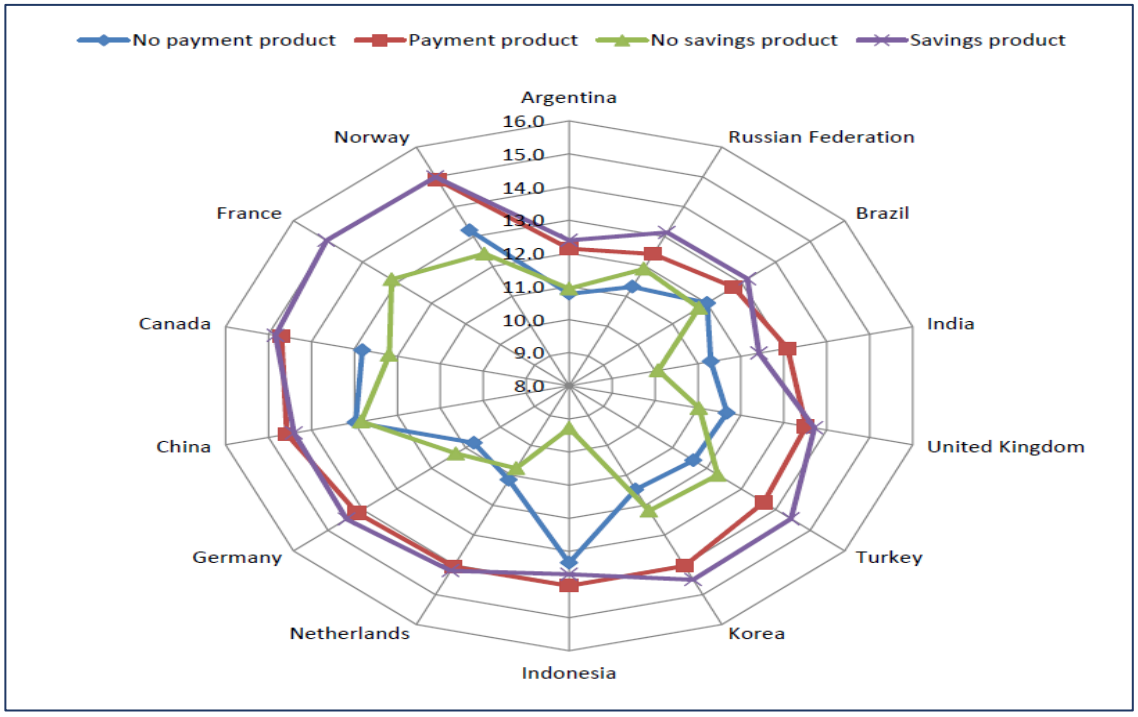

Figure 6. Financial literacy levels and financial instrument usage
Source : G20/OECD INFE Report

People showed interest and cryptocurrencies have gained ground in finance universe in a short time. This thesis makes contribution to literature in terms of presenting the relationship between cryptocurrency investment decisions and financial literacy including cryptocurrency knowledge.

The contribution of this thesis to the literature is three-fold. Firstly, this is the first research to examine the financial decision-making by investors regarding investing in cryptocurrencies. Secondly, the impact of financial literacy on this decision-making is explored and lastly the impact of cryptocurrency literacy is investigated. For this research a unique survey is designed and two literacy indices are developed; (i) financial literacy and (ii) cryptocurrency literacy.

The cryptocurrency market participation decision is analyzed by a three-step logistic regression model. Initially, the impact of demographics is explored. Then respectively financial literacy and cryptocurrency literacy indices are added to the model. We find that while financial knowledge has no impact on cryptocurrency participation, on the other hand, cryptocurrency literacy has direct effect on cryptocurrency participation via purchasing, mining/minting cryptocurrencies, ownership and future ownership intention.

Rest of the study consists of 5 parts as literature review, theory and hypothesis development, research methodology, analyses and findings and conclusion. Literature review chapter includes various studies discussing comparison of currencies and cryptocurrencies, technology behind cryptocurrencies, security and storage issues, cryptocurrencies valuation and adoption approach of cryptocurrencies. In the theory and hypothesis development part, hypotheses of this study are established and in research methodology section details and design of questionnaire to test these hypotheses is explained. Analysis of data collected through questionnaire is made in analysis and findings part and the study finalizes with conclusion section.

CHAPTER 2

LITERATURE REVIEW

2.1 Technology behind cryptocurrencies

Bitcoin as the pioneer of cryptocurrencies and many others rely on an innovative architecture which is blockchain technology. In the blockchain structure, peer-to-peer transactions are recorded in groups to blocks in a chronological basis with timestamps and these blocks are distributed to various nodes in the network. Each block is chained with previous and next one in a historical recording system since the first block and every accepted and valid transaction is recorded and distributed through chain of blocks (Trautman, 2016).

Blockchains are considered as digital distributed ledgers which are de-centralized, replicated and shared database record of peer-to-peer transactions secured by cryptographic hashing algorithms (Treleaven, Brown, & Yang, 2017).

In order to avoid any illegitimate or defective transaction record, the blockchain system needs consensus of computers on the network. Only after the transactions are confirmed as valid in a new block by taking the previous blocks into consideration, this new block is added to blockchain, distributed to the network and gains validity. Due to this decentralized consensus and confirmation mechanism, without any trusted third-party authorization, blockchain structure ensures validity of peer-to-peer transactions and their recordings only one time (Peters & Panayi, 2016).

While blockchain infrastructure eliminates the trusted third-party authorization need and solves the transaction confirmation problem within the blockchain mechanism,

in terms of participants of transaction verification process, there are certain types of blockchain structures.

In permissionless blockchain, like the Bitcoin and Ethereum network, anyone can participate in transaction and block confirmation process without prior authorization, thus, participants are anonymous and they are protected against identity forgery. On the other hand, in permissioned blockchain structures including Ripple, Hyperledger and Eris networks, only previously chosen and authorized computers in the network can take role on the verification of transactions (Peters & Panayi, 2016).

The anonymity in cryptocurrency ecosystem is ensured by public key infrastructure in which public and private keys are fundamental components. Public key is employed to identify transaction addresses and private key is used to sign transactions without the need of real identification (Conoscenti & Martin, 2016).

Blockchains come with their native currencies; i.e. Bitcoin for blockchain. Cryptocurrency transactions are recorded in a decentralized accounting system via distributed ledger technology (DLT) running on devices in the network. Cryptocurrency transfers in blockchain architecture need verification to be added to the transaction ledger and formed in chain of blocks and this verification process is actualized by cryptocurrency software owners which are called as miners (Eyal, 2017).

Using their computational resources, miners compete with each other in order to be the first one who verifies transactions, converts them into block and adds blocks to ledger. While distributed characteristic of blockchain technology eliminates the need of trust for cryptocurrency transfers because the same copy of transaction blocks and updated ledgers are distributed to each independent computer in the network, still an

individual miner or a mining group exceeding the 50% of total computational mining power can overcome other miners in the competition to verify transactions. In such a case, miners can control blocks and consequently the ledger, known as 51% attack and it may bring double spending problem enabling to use the same cryptocurrencies repeatedly (Extance, 2015).

Since mining activities are totally online and not compulsory to be performed in a specific location, miners can perform mining activities in various geographies over the world. Still, Rauchs et al. (2019) finds that miners seek certain conditions to set up their mining facilities in a certain area. These factors are sufficient and low – cost electricity, favorable regulatory environment, political stability, fast internet connection, cold climate conditions, competent labor force and inexpensive land. According to mentioned elements, mining activities are concentrated especially on certain geographies and miners prefer to locate their facilities primarily on Canada, USA, Russia, China and Australia.

Mainly most of the cryptocurrencies rely on common infrastructure and working mechanism. Still, certain characteristics differ from one cryptocurrency to another which are the total number of coins (total money supply), the number of coins each block contains, the time interval for mining of each block, the mining algorithm, difficulty level of mining mechanism and market price (Hayes, 2017).

Notably Bitcoin, most of the cryptocurrencies rest on blockchain technology. However, different cryptocurrencies work on different technology infrastructures such as holochain, tangle, nano and hashgraph infrastructures and these network structure technologies enable secure peer-to-peer transactions.

A study analyzing data collected from industry players displays that cryptocurrency or in much broader term cryptoasset ecosystem mainly consists of four key branches which are exchange services, payment services, storage services and mining service. More than half of the companies, especially large entities in the industry have provided more than one direct service simultaneously such that 72% of the firms have operated in exchange segment, where 61% of the entities have provided storage services and 49% of them have provided payments services by 2018 (Rauchs et al., 2019).

2.2 Fiat currencies vs cryptocurrencies

Since its invention and first usage in place of bartering mechanism, various things have been used as money such as metal coins, paper bank notes, credit cards, virtual currencies and as a recent one cryptocurrency. From the viewpoint of economists, money has three attributes and in order to call something as money it is needed to function as 1) a medium of exchange, 2) a store of value and 3) a unit of account (Carrick, 2016; Kelly, 2014; Yermack, 2013).

Beyond traditional characteristics of money which are unit of account, store of value and medium of exchange, currencies also carry certain additional attributes in modern financial system such as insurance of currency deposits, loan contracting, issuing credit and debit cards (Yermack, 2013).

Different from conventional currencies, Bitcoin as first cryptocurrency relies on a different infrastructure in which transactions verified through mining process are recorded in blockchain system and security is ensured by private keys. Although Bitcoin rests on a different structure, in terms of the conventional currency definition, Bitcoin carries the medium of exchange attribute because it is used for purchase transactions.

However, Bitcoin falls short to satisfy the other two conditions in definition. Price fluctuations prevent it from being a trusted store of value and additionally lack of value expression of goods and services with Bitcoin units keeps it from carrying unit of account attribute (Kelly, 2014).

Accordingly, while cryptocurrencies have suitable infrastructure to perform the medium of exchange role via online transactions, they lack the other two functions which are necessary to be considered as fiat money. Furthermore, while scheduled growth in supply contributes to the appeal of cryptocurrencies as store of value, increases in supply cause perception in holders that their coins devalue and this results in incredibility of currency which negatively affects the store of value role. Significant fluctuations and high volatility in prices of cryptocurrencies also lead to instable values, which restrains them from functioning the role of unit of account (Ammous, 2018).

Carrick (2016) also discussed that it is not totally clear that bitcoin satisfies transaction criteria compared to many other currencies because it has small daily transaction volume. While Bitcoin can be usable as a unit of account thanks to its divisible, fungible and countable characteristic, high volatility brings debates on pricing goods and services; and Bitcoin is regarded by users as an investment instrument rather than a currency with store of value.

In addition to these three main properties of money, in order to universally accept something as money Dorofeyev, Kosov, Ponkratov, Masterov and Karaev (2018) discussed five other characteristics which are divisibility, portability, durability, recognizability and standardization. Their analysis through comparing cryptocurrencies with precious metals as gold and traditional money as cash and non-cash (electronic money) in terms of these properties and four more properties which are security,

integration into financial system, speed and financial costs exhibits that cryptocurrencies are the best second form of money behind non-cash (e- money). While they have similar points in terms of standardization, durability and divisibility, cryptocurrencies fall behind e-money regarding portability, recognizability, security, integration, speed and commissions as financial costs. Thus, in order to be widely accepted and used instruments in global finance system, cryptocurrencies need certain enhancements especially for security, transaction speed and efficiency, regulatory amendments and integration with financial system and currently used financial instruments.

Rauchs et al. (2019) search for acquiring ways and integration level of cryptocurrencies and find that bank wire is the most supported method by service provider companies to trade cryptocurrencies with fiat currencies. Cash, debit card, credit card, online transfer and ATM are other common accepted ways to deposit and withdraw. Market integration is crucial in order to be used as payment method especially for satisfying medium of exchange function of money and they find that around one third of cryptocurrency payment service provider entities do not have existing relationship with current payment ecosystem. Overcoming volatility issue is also crucial for a healthy integration. In this regard, stable coins fixing their value to stable assets such as US Dollar and gold enable stabilizing fluctuations and preventing high volatility and thus, contribute integration of cryptocurrencies into existing financial system.

Cryptocurrencies enable low transfer costs in transactions. On the other hand, lack of central control body such as a country, a bank or an institution brings the outcome that the precision of transfers is not under guarantee (Dwyer, 2015).

Along with the discussions whether cryptocurrencies are alike fiat currencies, Bitcoin, the first and most widely used one is regarded as substitute for fiat currencies, since at least theoretically it shows characteristics of being currency.

Carrick (2016) discussed bitcoin and its substitution role for fiat currencies in emerging markets which experience instable economic conditions, inefficient and costly financial transactions, especially for international economic activities and immature financial systems. Despite its high volatility relative to fiat currencies, Bitcoin can be a favorable instrument as a complement to emerging market currencies through enabling effectiveness and efficiency in financial and commercial transactions and balancing currency portfolio without being influenced by political and economic instabilities.

While Bitcoin brings some challenges to certain organizations such as governments, banks, payment processors and payment gateways, value of Bitcoin is preserved not only from political and economic instabilities but also from interventions by a certain country. Bitcoin provides opportunity for several organizations and players especially for content creators selling their goods and services worldwide such as authors, musicians, film makers, tourism and travel agencies (PriceWaterhouseCoopers, 2014).

2.3 Consensus mechanism of cryptocurrencies

Security is a major issue for cryptocurrency ecosystem because of its peculiar working mechanism as transactions are irreversible, in addition to lack of comprehensive regulations and insurance options in case of security breaches. Rauchs et al. (2019) point out that along with price escalation by 2017, security risks for cryptocurrencies have

become concerning and at least 1.5 billion US Dollar worth cryptocurrency funds have been lost or stolen because of security breaches and hacking activities.

In order to ensure security, accuracy and authenticity of transactions, cryptocurrency systems work with a consensus algorithm. This consensus is realized differently in different systems.

In Proof of Work (PoW) protocol in order to reach consensus, verifiers called as miners, use their computational power to confirm validity of transactions and blocks. At the end of this mining process, valid transactions are added to blocks, authenticated blocks are generated and miners receive rewards and fees (Seang & Torre, 2018).

The Proof of Work protocol let anyone to join mining process and to be miner without having any cryptocurrency deposit in the network, which causes proof-of-work protocol become vulnerable to attacks. Miners having more than half of the mining capacity of the network can control the chain through creating their own blocks because when a miner controlling over 50% of the network with attack intention generates pseudo blocks, other miners follow this blocks and chain moves as attackers' directions. Because of this vulnerable structure of Proof of Work protocol, currencies working with Proof of Work algorithm face the threat of being attacked, called as 51% attack risk (Seang & Torre, 2018).

In another consensus protocol which is Proof of Stake (PoS), verifiers called as minters or validators which are stakeholders as owning a cryptocurrency in the system participate in verification process. Therefore, in the Proof of Stake validation process called as minting, computational power is not determiner but being stakeholder of a

certain currency is required to participate verification of transactions and blocks. As a reward of minting activities minters or validators collect fees from investors (Seang & Torre, 2018).

2.4 Cryptocurrency wallets

Wallets, in terms of conventional usage, are benefited to store and keep assets and balances, however, in cryptocurrency ecosystem wallets are utilized to preserve private keys bound up with public address in order to reach associated account's details, transaction history and balance information, recorded to the ledger distributed to various nodes. Hence, the ownership of a certain account is proven by possessing private key which is affiliated to that account and stored in a secure wallet (Howell & Potgieter, 2019).

According to their storing methods, wallets take different forms as cold wallets and hot wallets. In cold wallet storage way, private keys are kept on hardware wallets and devices which do not have internet connectivity, while in hot storage method, private keys are stored in wallets having internet connection. While in the beginning stages of cryptocurrency ecosystem, wallet solutions were limited to store private keys, with the development and enlargement of cryptocurrency industry, various wallet options have emerged such as mobile wallets, web-based wallets, desktop wallets, tablet wallets, hardware wallets and vault services. (Rauchs et al., 2019)

Rauchs et al. (2019) also discuss the share and density of wallet forms and types provided by storage entities as storage services. In their research, they present that in general, entities and companies in the industry provide users with more than one wallet

format. As of 2018, mobile wallets are the most commonly provided wallet type from storage providers by 62%. Web-based wallets are the second largest wallet type offered by providers by 53%. The rate of remaining wallet types are desktop wallets by 42%, tablet wallets by 31%, hardware wallets by 24% and vault services by 31%.

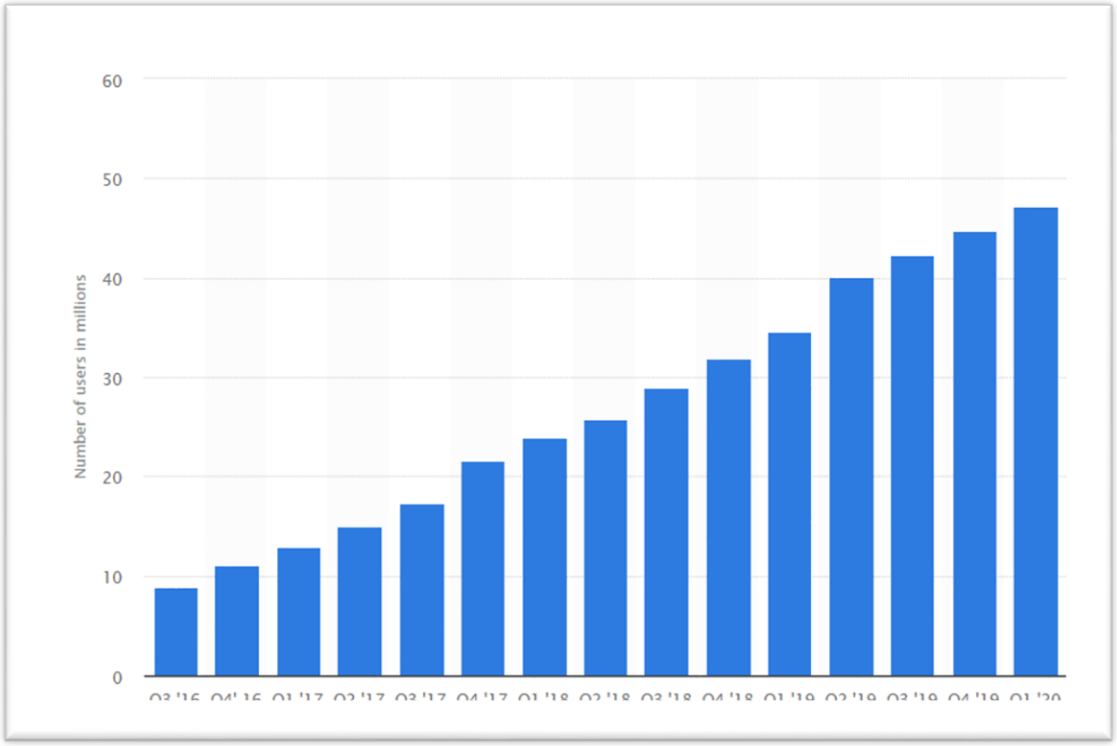

Figure 7. Number of blockchain wallet users

Source: https://www.statista.com/statistics/647374/worldwide-blockchain-wallet-users/

Cryptocurrency market expands among individuals, new wallet users participate to the ecosystem and the number of wallet users increases. Figure 7 shows that number of wallet owners which was 8.95 million in third quarter of 2016 reached to 47.14 million by first quarter of 2020.

A study analyzing data collected from industry players displays that cryptocurrency or in much broader term cryptoasset ecosystem mainly consists of four key branches which are exchange services, payment services, storage services and mining service. More than half of the companies, especially large entities in the industry have provided more than one direct service simultaneously such that 72% of the firms have operated in exchange segment, where 61% of the entities have provided storage services and 49% of them have provided payments services by 2018 (M. Rauchs et al., 2019).

2.5 Drivers of cryptocurrency adoption decision

From the user perspective main motivations behind the interest in cryptocurrencies are that cryptocurrencies enable reducing transaction and exchange costs for purchases, making anonymity available through pseudonymous accounts, protecting against inflation (Moore, 2013).

Cryptocurrencies carrying properties of money as all other currencies also bring solution to double spend problem and eliminate any government and central bank intervention to manipulate their value (Van Alstyne, 2014),

Schuh and Shy (2016) studied the view of US consumers toward cryptocurrency through measuring people's cryptocurrency awareness, usage intentions, preferences and ownership. They concluded that while individuals with higher income and education level are much more familiar with cryptocurrencies, obtaining rate is not high even among people who are familiar with cryptocurrencies. Most of the holders consider cryptocurrencies as a financial instrument to invest and are optimistic for price increases.

Most general characteristics of people who prefer obtaining cryptocurrencies are becoming interested in new technologies, seeing cryptocurrencies as an investment product, using them in trade and paying attention to anonymity in payments (Schuh & Shy, 2016).

In another study, Henry, Huynh and Nicholls (2019) studied Canadian people's familiarity with and usage of Bitcoin. They measured and analyzed public awareness, knowledge of Bitcoin, Bitcoin ownership and driving forces to use and not to use Bitcoin through conducting surveys in 2016 and 2017. They found that both awareness and knowledge levels increased from 2016 to 2017. Knowledge levels differ between adopters and non-adopters as Bitcoin owners are more knowledgeable compared to non-owners. Ownership also showed increase compared to previous year as ownership in 2017 is around 66% higher than 2016.

Henry et al. (2019) found most of the Canadian people regard Bitcoin as an investment and acquire because of this reason. As a second important reason, they acquire Bitcoin because their friends' have Bitcoin. Interest in new technologies and usage in trade are other main driving motivations among Canadian individuals to use Bitcoin.

Bitcoin adoption in electronic commerce activities among Turkish residents was discussed and it is found that relative advantage of Bitcoin compared to existing financial instruments as payment methods has a positive effect on Bitcoin adoption. Compatibility with user needs and practices also contribute Bitcoin usage in electronic shopping activities (Serhatlı, 2019).

In another study, it is discussed that due to the fact that cryptocurrencies enable price stability and more security compared to fiat currencies and they gain more ground

day by day, certain regulations and rules regulating cryptocurrency ecosystem might be imposed. Moreover, governments and central banks, may issue their own cryptocurrencies (Eken & Baloğlu, 2017).

2.6 Risks of cryptocurrencies

Major risks regarding to cryptocurrencies are that cryptocurrencies are available to be used with criminal intent and promote illegal actions because of their anonymous characteristics (Van Alstyne, 2014),

Rapid and wild fluctuations in exchange rates, design of irreversible transactions in case of fraudulent operations, being vulnerable to be stolen from wallets causing wallet owners to lose their money totally are other factors preventing them to be accepted by wide majority (Moore, 2013).

As a totally new financial instrument, sometimes Bitcoin is regarded as speculative because of being non-guaranteed by anyone to repay later, not being widely used as a payment and transfer instrument, its vulnerability against cyber-attacks, being attractive to be used for illegal and criminal intentions, lack of regulations (Bouoiyour, Selmi, Tiwari, & Olayeni, 2016).

People who do not prefer to use cryptocurrencies generally submit that they have difficulty to understand the technology behind, to acquire and use them and they worry about high volatility in values (Schuh & Shy, 2016).

2.7 Factors influencing cryptocurrency values

Balcilar, Bouri, Gupta and Roubaud (2017) analyze the prediction capability of transaction volume to predict return and volatility for Bitcoin by using exchange data and find that in normal market conditions, volume can be beneficial instrument to

predict Bitcoin returns, whereas in bull and bear periods of market volume shows no clue to predict returns.

For the sake of unearthing the underlying factors why cryptocurrencies have value while they are not supported by governments and central banks, Hayes (2017) studied price generation of Bitcoin and other cryptocurrencies and found that there is a positive correlation between value of a cryptocurrency and computer processing power used for mining activities and the higher processor power dedicated for mining effort, the higher the price of cryptocurrency. On the other hand, cryptocurrencies with the algorithms enabling production of plentiful units of coins in blocks and generating rapid block formation have lower value, which means the higher the rate of coins produced per minute, the lower the price of that cryptocurrency.

In addition, computation power requirement also differs between different working mechanism and compared to SHA-256d protocol, scrypt algorithm needs more computation power in order to eliminate cyber-attack attempts. Hence, because of higher computation power in mining activities, values of cryptocurrencies working with scrypt algorithm are higher than cryptocurrencies based on SHA-256d protocol (Hayes, 2017).

Aggarwal, Patel, Varshney, & Oostman (2019) discuss societal elements impacting cryptocurrency ecosystem through studying media resources, news, social media posts and analyzing their effects on cryptocurrency prices. Some of the factors lead price increases while some others cause prices to fall and some of them have more powerful effects on prices compared to others. Negative views of celebrities, negative government regulations and both positive and negative bank declarations regarding cryptocurrencies lead price increases. On the other hand, regarding to cryptocurrencies, positive official regulations, announcements from authorities and big firms, views of

famous technology personalities, positive views of celebrities, news from cryptocurrency exchange markets, information related to cryptocurrency bans and frauds have negative impacts on cryptocurrency ecosystem and they cause price decreases.

Far from price differences for different cryptocurrencies although they have similar attributes, same structures and working algorithms, even the price of a specific cryptocurrency may vary from one exchange market to the next.

Pieters and Vivanco (2017) study simultaneous Bitcoin prices among 11 various exchange markets which are ANX, BitK, BitS, BTC-e, HitBTC, itBit, Kraken, Lake, Local, Rock, BPI and discusses exchange markets in terms of (1) fees for trade and transactions; (2) exchange transparency as market's terms and conditions, physical and server locations of incorporation; and (3) regulations as requiring consumer information for KYC (Know Your Customer) and AML (Anti Money Laundering). This study finds that certain characteristics of these exchange markets may influence prices of Bitcoin across markets. While fees and transparency have no significant impacts on prices, exchange markets requiring regulations as to customer identification for account creation shows variation in price formation compared to markets that do not require.

Li and Wang (2017) study the effects of certain technical and economic factors over Bitcoin prices against US Dollar through analyzing time series data. The study finds that in short term, mining difficulty affects cost of production and thus Bitcoin exchange rates but this impact loses its weight in long run.

Similarly, public interest and recognition through internet searches, social media shares and enormous media coverage positively affect Bitcoin prices in short run (Bouoiyour et al., 2016).

For the long term Bouoiyour et al. (2016) note that the price formation of Bitcoin is affected by various factors such as demand and supply mechanism, exchange trade rates, stock market, exchange rates relative to other currencies, petrol prices and transaction volumes.

Cryptocurrencies, in general are presented to the attention of users via white paper which explains the solution to a specific issue, description of proposed product for the issue, business plan, working mechanism, issuing of tokens during initial coin offering (ICO) process, functions and usage of tokens and other technical details. Similar to initial public offering (IPO) mechanism of stocks, cryptocurrencies start their adventure in finance universe through ICO and valuation of cryptocurrencies starting with white paper continues during ICO process and afterwards.

In this regard, Conley (2017) searches for an answer to the question regarding how creators, investors and users value cryptocurrency tokens offered via ICO. As a new financial form, cryptocurrencies can show different characteristics of different financial instruments and according to how they are regarded, various economic models and theories might be useful for valuation of tokens. When cryptocurrency tokens are accepted as currency, then quantity theory of money (QTM) meaning $PT = MV$ might be applied where M is money supply, V is velocity of money, P is price level and T is transactions in a period. In case of regarding cryptocurrencies as security, then the value of tokens is assigned through calculating total present value of future earnings.

Efficient market theory (EFT) evaluating future expected price; behavioral models saying value creation depends on perception and assessment of investors; and lastly metagame value asserting that token value is settled by intention and purpose of

usage are other methods and models for the valuation of cryptocurrency tokens during the ICO process (Conley, 2017).

CHAPTER 3

THEORY AND HYPOTHESIS DEVELOPMENT

3.1 Underlying factors affecting the adoption of cryptocurrencies

Cryptocurrency ecosystem is emerged and developed as a different form with its working mechanism and underlying structure than conventional finance system. Thus, consumer perception toward this new concept is not so clear and exploring the factors that investors and traders consider in case of adopting cryptocurrencies is crucial for expansion and improvement of market.

Baumöhl (2019) analyzed the correlation between six currencies largely traded in foreign exchange markets and six cryptocurrencies having highest market capitalization and found that there is no correlation. Hence, on the basis of this non-correlation, researcher concluded that people investing in forex markets can diversify investment instruments and reduce portfolio risks.

Esmaeilzadeh, Subramanian and Cousins (2019) projected a theoretical model indicating the factors influencing cryptocurrency adoption as an extending form of Unified Theory of Acceptance and Use of Technology (UTAUT). They proposed that positive utilities such as pseudonymity, globally usage opportunity, user friendliness, fast transaction, investment opportunity and low cost attributes contribute to value of cryptocurrencies perceived by individuals. While these benefits affect perceived value in a positive manner, risks such as instable and volatile prices, intangible and non-physical forms, difficulty to trace transactions, fraud threads, irreversible transactions, technical complexity and lack of regulations adversely impact perceived value determining manner toward cryptocurrencies.

On the other hand, social effects such as social image of being a cryptocurrency user, network of users, social norms and perceived image in public; structural provision such as perceived vendor support for payment services and perceived facilitating infrastructure influence adoption intention to cryptocurrencies in a positive way.

Esmaeilzadeh et al. (2019) conclude that together with attitude toward cryptocurrencies moderated by personal traits such as self-efficacy and innovativeness of individuals, social effects and structural provision determine cryptocurrency adoption decisions of individuals.

Spenkelink (2014) studies essential factors affecting the adoption decision for cryptocurrencies in terms of IDT – innovation diffusion theory. The researcher addresses that low transaction costs, transaction speed and irreversibility in payments compared to certain payment methods, lack of single point of failure in payments, low barrier to enter the ecosystem and positive image as a financial instrument are relative advantages of cryptocurrencies in adoption. On the other side, in addition to use for criminal intentions, complexity and usage difficulty of cryptocurrency ecosystem, price instability are regarded as serious issue and even as drawback in adoption decision.

Decentralization is a debate because while cryptocurrency mechanism is not controlled by a central authority, on the other hand because of lack of government involvement and common regulatory provisions there is no guarantee mechanism in case of any collapse or loss of funds. Security is another important debatable issue and adoption behavior may be influenced depending on security level of encryption algorithm. Cryptocurrency mechanism brings not complete but certain level of privacy and anonymity because links between wallet addresses and individual owners can be revealed through certain ways. However, mixing services can complicate these tracing

efforts. Therefore privacy, anonymity, security and decentralization are debatable points from stakeholder to stakeholder for adoption decision (Spenkelink, 2014)

Roos (2015) studied various elements having effect on the decision of adopting Bitcoin in SMEs – Small and Medium Enterprises. The researcher finds that managers of SMEs put emphasis on mainly price value of Bitcoin and performance expectancy as to performance enhancement and advances. Moreover, managers having Bitcoin usage habits are much more inclined to adopt Bitcoin for their businesses and in addition, trust is a crucial factor for adoption behavior.

While these studies explore determinants of intention to adopt cryptocurrencies within the technology adoption literature, in this study we explore the impact of financial and cryptocurrency literacy on cryptocurrency adoption. We hypothesize that there is a relation between market participation and financial and cryptocurrency literacy.

3.2 Herding behavior effect in cryptocurrency adoption

Since cryptocurrencies differ from other traditional financial tools in terms of working mechanism, decentralized structure and especially speculative value performance, some researchers give attention to cryptocurrency investor attitudes.

Vidal-Tomás, Ibáñez and Farinós (2019) studied dynamics affecting investment decision and herding behavior effect among cryptocurrency investors. Researchers find that while traders assume a rational price expectation attitude during excessive value movements, investment decision is shaped by herding behavior especially in down market period and since investors have less information about smaller cryptocurrencies,

traders investing on these cryptocurrencies pay attention to the price movements of largest cryptocurrencies.

In another paper, Kallinterakis and Wang (2019) found that herding behavior is much more effective during low volatility periods compared to high ones and when volume and activeness are high in the market investment decisions are characterized by herding attitude. Furthermore, researchers concluded that smaller cryptocurrencies trigger herding phenomenon and increase its extent.

Ballis and Drakos (2020) put forward that cryptocurrency market is open and suitable for herding attitudes and certain investors follow other traders' actions without rational foundations. They also found a clue that during value increase periods herding behavior is more influential in comparison to bearish markets.

Baur and Dimpfl (2018) analyzed 20 largest cryptocurrencies to identify volatility characteristics in prices and found that in positive shock terms prices fluctuate much more compared to negative shock periods. Starting from this finding, researcher deduced that higher volatility in price increase periods derives from FOMO (Fear of Missing out) effect causing to fear of missing chance while others seize opportunity, herding effect causing illiterate investors to act as others and pump and dump movements resulting in artificial price inflations.

These researches show that significant herding behavior exists within the cryptocurrency trading and thereof emphasize the importance financial and cryptocurrency literacy. Accordingly, this research hypothesizes that there is a relationship between cryptocurrency literacy and market participation.

3.3 Effect of financial literacy on cryptocurrency participation

Mien and Thao (2015) study the effects of financial knowledge, financial attitude and locus of control on financial decisions and acquisition, allocation and utilization of economic resources and facilities. They addressed that financial attitude has the greatest influence on financial manner and financial literacy is also in a positive relationship with financial behavior. On the other side, locus of control influences financial behavior in a negative way.

Ali, McRae, and Ramsay (2014) assess financial knowledge and its influence on financial decisions among Australian secondary school students from different backgrounds and regions as rural or metropolitan. They find out that financial literacy is shaped by mainly finance education, parental leading, friends, social and cultural environment. Young people pursuing independent or autonomous life after school are much more equipped and literate with regards to financial matters and also, they are more aware of consequences of financial decisions.

Akin, Aysan, Ozcelik, and Yildiran (2012) study financial literacy and financial activeness levels of Turkish residents and their credit card usage satisfaction degree. They find that the more information consumers have regarding financial instruments and services, the more satisfied when they utilize credit cards. Together with financial knowledge, financial activeness in credit card market contributes to satisfaction level of card holders because financially illiterate or inactive consumers tend to make unreasonable preferences, encounter problems and experience credit card related troubles resulting dissatisfaction.

Many researches indicate that knowledge regarding finance and economy is determinant in financial decision-making process. Mien and Thao (2015) found that finance knowledge favor financial decision and acquisition. Ali et al. (2014) indicate that financial literacy is effective on understanding the outcomes of individuals' financial choices. Akin et al. (2012) put forward that the more people financially literate, the more they active in market and utilize financial instruments.

Van Rooij, Lusardi, and Alessie (2011) studied the relationship between Dutch people's financial literacy and their financial decisions as participating stock market. In order to assess financial literacy, the researchers organized two separate question modules as basic literacy questions and advanced literacy questions, and conducted a survey to gather data from respondents. They find that that when financial literacy level increases, participation rate to stock market also increases.

While many researchers deduced that financial knowledge, familiarity to economy dynamics and financial literacy directly impact individual attitude toward financial instrument and investor decisions. However, it is also revealed by researchers that cryptocurrency ecosystem is a new market in which decisions may be shaped by herding attitudes without rational foundations. Hence, financial literacy influencing on investor decisions in other traditional markets may not show same direct impact on cryptocurrency market. This research investigates the impact of financial literacy on cryptocurrency market participation following the approach of van Rooji et al. (2011). Accordingly, this research hypothesizes that there is a relation between financial literacy and cryptocurrency participation.

Ali, McRae, & Ramsay, (2014) assessed that financial knowledge influencing financial decisions and behaviors is shaped by finance education, parental leading, friends, social and cultural environment. Esmaeilzadeh et al. (2019) concluded that personal traits and social effects influence cryptocurrency adoption decisions. Accordingly, this research hypothesizes that there is a relationship between demographics and cryptocurrency participation.

CHAPTER 4

RESEARCH METHODOLOGY

This chapter gives information and details about research methodology of the study regarding questionnaire preparation, survey questions, survey conducting methods and sample of respondents.

4.1 Survey Development

A questionnaire is designed to collect data on financial literacy, cryptocurrency literacy and demographics. Questionnaire is composed of 5 separate sections namely (i) self-assessment, (ii) financial literacy, cryptocurrency awareness, cryptocurrency literacy and demographic questions.

In order to assess financial literacy, we follow the methodology of van Rooij et al. (2011) and use basic and advanced financial literacy scales along-side self-financial literacy assessment questions.

In order to measure financial literacy and cryptocurrency literacy, findings and survey questions of previous studies were used to generate questionnaire.

4.1.1 Self-Assessment survey questions

Self-assessment questions collect data on primary sources of information for the respondents regarding their financial decision-making process and gain an understanding on how literate they perceive themselves. Table 1 presents the self-assessment survey questionnaire items.

Table 1. Self-assessment survey questions

Content	Questions	Source
Self-Assessment	What are your most important sources of information and advice when you need to make important financial decisions? Parents, friends or acquaintances Newspapers Financial magazines, guides, books Bank brochures and customer representative Advertisements on TV, in papers, or other media Professional financial advisers Financial computer programs Financial information on the Internet Other	van Rooji et al., 2011
Self-Assessment	How would you assess your understanding of economics? (1 means very low and 7 means very high on a 7-point scale) 1 (very low) 2 3 4 5 6 7 (very high)	van Rooji et al., 2011
Self-Assessment	To what extent do you need economic knowledge in your daily life and activities (work, hobby, etc.)? A lot Some Little Hardly ever	van Rooji et al., 2011
Self-Assessment	Which of the following investment instruments do you use? Term deposit account / participation account Stocks Bill / bond Gold Foreign currency Personal retirement insurance Real estate Forex Investment fund Other …	

4.1.2 Financial literacy (FL) survey questions

Financial literacy section of the questionnaire is composed of basic and more advanced questions. This section aims to measure basic financial literacy knowledge of

respondents regarding functions of money (Carrick, 2016; Kelly, 2014; Yermack, 2013), interest rates (OECD, 2017), interest rate and inflation relation, nominal and real value difference of money.

Table 2. Basic financial literacy survey questions

Content	Questions	Source
Basic Financial Literacy	Which of the following is the property of money? Medium of exchange Unit of account Store of value All of the above Do not know	Yermack, 2014; Carrick, 2016; Kelly, 2014
Basic Financial Literacy	Suppose you have 100 TL in your bank account and the interest rate is 10% per year. How much is the money in your account after the interest payment is made after 1 year? (ignore tax) More than 110 TL 110 TL Less than 110 TL Do not know	OECD INFE Report, 2017
Basic Financial Literacy	Suppose that the interest rate applied to the money in your bank account is 8% annually and the inflation rate is 10% annually. After 1 year, how much will be the purchasing power of the money in your account? (ignore tax) More than today's purchasing power Same as today's purchasing power Less than today's purchasing power Do not know	van Rooji et al., 2011
Basic Financial Literacy	In an environment where inflation is experienced, suppose that your friend inherited 10.000 TL today and his brother inherited 10.000 TL 3 years later. Who become richer due to inheritance? Your Friend Brother of your friend Both are equally Do not know	van Rooji et al., 2011

Table 3 presents advanced financial literacy questions including risk and revenue relation, functions of stocks and bonds as investment instruments, relationship between

interest rate and bonds prices, function of stock markets, portfolio risk spreading and price volatility of certain instruments (van Rooij et al., 2011).

Table 3. Advanced financial literacy survey questions

Content	Questions	Source
Advanced Financial Literacy	Which of the following statements describes the main function of the stock market? The stock market helps to predict stock earnings The stock market results in an increase in the price of stocks The stock market brings people who want to buy and sell stocks together None of the above Do not know	van Rooji et al., 2011
Advanced Financial Literacy	Someone buying the stock of company A on the stock exchange market; Owns a part of company A Lends money to company A Is responsible for debts of company A None of the above Do not know	van Rooji et al., 2011
Advanced Financial Literacy	Someone who buys a bond issued by company A; Owns a part of company A Lends money to company A Is responsible for debts of company A None of the above Do not know	van Rooji et al., 2011
Advanced Financial Literacy	Under normal conditions, which of the following asset yields the highest fluctuation over time? Savings accounts Bonds Stocks Do not know	van Rooji et al., 2011
Advanced Financial Literacy	If an investor distributes his/her money among different assets instead of investing in a single asset, risk of losing money Increase Decrease Stay the same Do not know	van Rooji et al., 2011
Advanced Financial Literacy	If the interest rate falls, what happens to bond prices? Increase Decrease Stay the same Do not know	van Rooji et al., 2011

4.1.3 Cryptocurrency awareness survey question

This section aims to identify respondents familiarity with cryptocurrencies (Schuh & Shy, 2016). Respondents answering awareness question as “Yes” continue to cryptocurrency related questions, while unaware respondents pass to demographic questions.

Table 4. Cryptocurrency awareness questions

Content	Questions	Source
Awareness	Have you ever heard of Bitcoin, Ethereum, Ripple or any other similar cryptocurrency? Yes No	Schuh & Shy, 2015

4.1.4 Cryptocurrency literacy (CL) survey questions

Cryptocurrency related questions in the survey reflect different aspects of cryptocurrency ecosystem. Cryptocurrency literacy questions start with participation and intention questions aiming to identify (i) whether respondents have ever owned in the past, (ii) have ever mined or minted cryptocurrencies, (iii) they own currently or (iv) have intention to possess in the future (Schuh & Shy, 2016).

Table 5. Cryptocurrency participation questions

Content	Questions	Source
Purchase	Have you ever purchased any cryptocurrency? Yes No	Schuh & Shy, 2015
Mining or Minting	Have you ever done cryptocurrency mining or minting? Yes No	Schuh & Shy, 2015
Participation	Currently do you own any cryptocurrency? Yes No	Schuh & Shy, 2015
Purchase Intention	In the future, do you think of buying, mining or minting cryptocurrencies? Yes No	Schuh & Shy, 2015

These questions shown in the table above are coded as dummies and used as our dependent variables in the analyses.

Table 6. Basic cryptocurrency literacy survey questions

Content	Questions	Source
Working Mechanism	Cryptocurrencies allow direct transactions between the two parties without the need for a trusted third party to be involved. True False Do not know	Henry et al., 2018
Total Supply	While the total supply of some cryptocurrencies is fixed, some others' total supply is changeable True False Do not know	Henry et al., 2018
Comparison to Fiat Currencies	Unlike fiat currencies, cryptocurrencies are independent of a central authority, and encryption methods are used to manage currency generation and fund transfers. True False Do not know	Dwyer, 2015
Working Mechanism	Cryptocurrency transactions are recorded in publicly available distributed ledgers True False Do not know	Henry et al., 2018
Comparison to Fiat Currencies	Bitcoin was issued and supported by a government True False Do not know	Henry et al., 2018
Valuation	Increase in the interest of social media and the public …..... the value of cryptocurrencies; Increases Decreases Does not affect Do not know	Li & Wang, 2017

Basic cryptocurrency literacy section includes various questions to measure knowledge regarding working mechanism as transaction types, recording method, total supplies, government support (Henry et al. 2019) and valuation (Li & Wang, 2017) of

cryptocurrencies in addition to their differences from traditional currencies (Dwyer, 2015).

Table 7. Advanced cryptocurrency literacy survey questions

Content	Questions	Source
Transaction Speed	Cryptocurrency transfer transactions take place instantaneously True False Do not know	Henry et al., 2018
Risk	Cryptocurrencies …..... portfolio risk due to low correlation between national currencies traded in Forex markets and cryptocurrencies Increases Decreases Does not affect Do not know	Eduard Baumöhl, 2019
Technical Aspect (51% Attack)	Cryptocurrencies working with Proof of Work (PoW) algorithm are more vulnerable to 51% attack risk. True False Do not know	Seang & Torre, 2019
Technical Aspect (POW)	In the Proof of Stake (PoS) consensus algorithm, the cryptocurrency miner's computational power is determinant in resolving cryptographic puzzles that confirm the accuracy of transactions True False Do not know	Seang & Torre, 2019
Technical Aspect (Wallets)	Cryptocurrency wallets are divided into two as hot and cold wallets depending on whether or not they work with internet connection True False Do not know	Rauchs et al. 2019
Technical Aspect (POS)	In the Proof of Stake (PoS) consensus algorithm, only users with that cryptocurrency can verify the accuracy of the transactions and participate in the new block creation process. True False Do not know	Seang & Torre, 2019

As presented in Table 7, advanced cryptocurrency literacy question set includes questions about technical aspect of cryptocurrencies such as transaction speed (Henry et al. 2019), risk diversification (Baumöhl, 2019), cyber-attack risk, differences between Proof of Work and Proof of Stake protocols (Seang & Torre, 2018) and cryptocurrency wallet types (Rauchs et al., 2019).

Respondents are also asked their reasons for adoption and non-adoption of cryptocurrencies according to their possessing conditions (Schuh & Shy, 2019).

Table 8. Drivers and risks of cryptocurrencies

Content	Questions	Source
Reasons for Owning	What are the main reasons for you to buy, mining or minting cryptocurrencies? (Answer if you bought cryptocurrency, participated in the mining or minting process) Being interested in new technologies Making investment Earning income by trading Using to purchase goods and services Making payments without being identified Making money order, EFT and other international payments Using secure blockchain technology to prevent loss and fraud Not trusting banks Not trusting local currencies Other …..	Schuh & Shy, 2015; Henry et al., 2018
Reasons for not Owning	What are the main reasons for not purchasing, mining or minting cryptocurrencies? (Answer if you have never had cryptocurrencies) I don't understand the technology behind it Not accepted as a means of payment everywhere Current payment methods meet all my needs The value of cryptocurrencies in terms of national currencies changes too much Not guaranteed by any state or central bank Not easy to buy or use Costs in transition from traditional financial system to cryptocurrencies are high Concerns about cyber theft Concerns about being out of the surveilance of regulatory agencies Other …..	Schuh & Shy, 2015; Henry et al., 2018

4.1.5 Demographic survey questions

The last section of the questionnaire composed of demographic questions including gender, age, marital status, education, business, and income in addition to specific education questions asking respondents' education background for finance and programming as demonstrated in Table 9.

Table 9. Demographic survey questions

Content	Questions
Gender	Gender: Female / Male
Age	Age interval: Less than 18 / 18 – 25 / 26 – 35 / 36 – 45 / More than 45
Marital Status	Marital status: Married / Not married
Education	Education degree: Primary school / High school / Associate degree / Undergraduate / Graduate / Doctorate
Education	Have you taken any economics / finance courses during your education? Yes / No
Education	Have you taken any coding / programming courses during your education? Yes / No
Business	The sector you work in:
Business	Occupation:
Income	Monthly personal income interval: Less than 3000 TL / 3000 TL– 5000 TL / 5000 TL– 10000 TL / 10000 TL– 20000 TL / More than 20000 TL
Income	Monthly household income interval: Less than 3000 TL / 3000 TL– 5000 TL / 5000 TL– 10000 TL / 10000 TL– 20000 TL / More than 20000 TL

4.2 Data collection

Data used in the study is collected through an online questionnaire. In order to increase representativeness of the sample, convenience sampling is preferred to collect data. The survey is prepared in Google Forms and is initially distributed to 6 people from different education, job and age backgrounds in order to test understandability and clarity of questions and answers.

After taking feedbacks from test sample, the final version of questionnaire is distributed via different online platforms. Questionnaire link is shared in social media platforms such as Whatsapp, Twitter and LinkedIn. Survey link is shared with connections through direct message in LinkedIn and they were asked to reshare with their connections. In addition, in Twitter and Linkedin, accounts interested in cryptocurrencies were also asked to share survey link with their followers and connections.

In addition to social networks, questionnaire is also shared through electronic mail with certain academicians from various universities studying cryptocurrencies or financial literacy and certain organizations doing business in cryptocurrency market.

4.3 Data cleaning

A total of 330 respondents have participated to the questionnaire. 280 of them have answered all questions while 50 respondents, who were unaware of cryptocurrencies, have skipped the cryptocurrency literacy questions due to questionnaire design.

Accordingly, Table 10 demonstrate that 85% of our respondents have heard of cryptocurrencies and 15% of the respondents have never heard of cryptocurrencies.

While descriptive analyses were made with all respondents, financial literacy and cryptocurrency literacy analyses were made by using the responses of 280 respondents.

Table 10. Cryptocurrency awareness rates

Have you ever heard of Bitcoin, Ethereum, Ripple or any other similar cryptocurrency?			
		Frequency	Percent
Valid	No	50	15.2
	Yes	280	84.8
	Total	330	100

Financial literacy questions aim to measure the knowledge of respondents and were coded as 1 if the answer is “do not know”, as 2 if the answer is “incorrect” and as 3 if they have chosen “correct” option. These categorical variables are then used in the frequency analyses for each literacy question. According to difficulty levels, both financial literacy and cryptocurrency literacy questions were separated as basic and advanced questions and frequencies of do not know, correct and incorrect responses were calculated similar to (van Rooij et al., 2011).

Following the methodology of van Rooij et al., (2011), factor analyses were made for financial literacy and cryptocurrency literacy questions to calculate basic and advanced financial and cryptocurrency literacy indexes. In order to make these calculations, correct answers were coded as 1 and not correct answers including do not know and incorrect responses were coded as 0.

On the other hand, we have also calculated total scores of financial and cryptocurrency literacy through summing up correct answers from which financial literacy and cryptocurrency literacy quartiles were calculated. While both financial literacy and cryptocurrency literacy questions were separated as basic and advanced

according to factor analysis results, quartiles could not be calculated for basic and advanced questions separately. Because of the limited question numbers, quartile borders have intercepted for certain question groups such as basic financial literacy quartiles and advanced financial literacy quartiles. Therefore, literacy quartiles were calculated for financial literacy and cryptocurrency literacy question in total.

In order to investigate the financial literacy and cryptocurrency participation relations and the cryptocurrency literacy and cryptocurrency participation relations, crosstab analyses and logistic regression analyses were applied. The results of the analyses are discussed in the next chapter.

CHAPTER 5

ANALYSES AND DISCUSSIONS

This section presents frequency, descriptive, crosstab, regression analyses and detailed findings from these analyses.

5.1 Demographic profiles of respondents

General demographic characteristics of 330 respondents including gender, age, marital status, education and income are presented in Table 11. Majority of the questionnaire participants are male, with 64.8% and the rest of participants are female, with 35.2%. More than half of the respondents are between 25 and 35 years old with 58.5%, while 17.6% is between 18 and 25, 17.3% is between 35 and 45, and among of all participants 6.7% is higher than 45 years old.

While 56.4% of respondents are not married, 43.6% are married. In terms of education levels, 89.7% of the participants have at least university degree as 59.4% of participants have undergraduate degree and 30.3% have graduate or doctorate degree.

When considered income levels, 19.4% of the participants earn less than 3000 TL personally while around one fourth of them earn between 3000 TL and 5000 TL. 40.6% of the respondents have 5000 TL – 10000 TL income level, while 11.8% earn income between 10000 TL and 20000 TL, and only 3.0% earn more than 20000 TL personally in a month.

Table 11. Demographics results

Demographic Variable	Category	Frequency	Percent
Gender	Female	116	35.2
	Male	214	64.8
Age	18 - 25	58	17.6
	25 - 35	193	58.5
	35 - 45	57	17.3
	More than 45	22	6.7
Marital Status	Married	144	43.6
	Not married	186	56.4
Education	Primary school	1	0.3
	High school	24	7.3
	Associate degree	9	2.7
	Undergraduate	196	59.4
	Graduate / doctorate	100	30.3
Personal Income	Less than 3000 TL	64	19.4
	3000 TL - 5000 TL	83	25.2
	5000 TL - 10000 TL	134	40.6
	10000 TL - 20000 TL	39	11.8
	More than 20000 TL	10	3.0

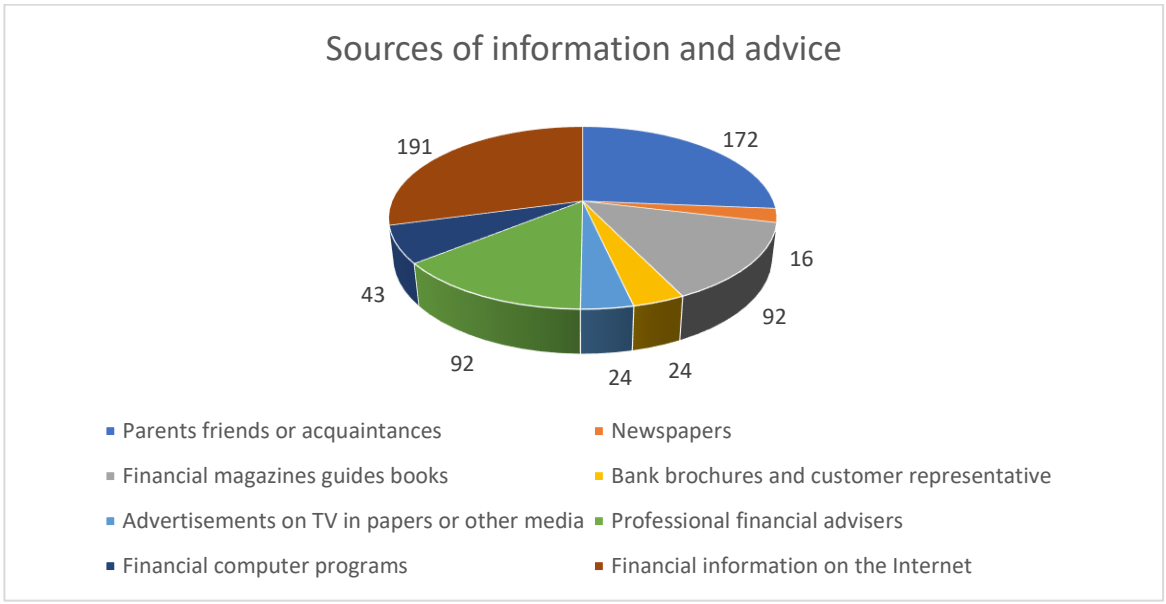

Figure 8: Sources of information and advice

In the beginning of the questionnaire, respondents are asked to answer their most important sources of information and advice when they need to make important financial decisions. The previous figure shows the summary of responses for information and advice sources. The primary sources of our respondents are internet and their family and friends.

Before responding financial literacy and cryptocurrency literacy questions, questionnaire participants are asked to answer self-assessment questions regarding understanding of economy and need for economy knowledge in daily activities. Table 12 shows frequencies and percentages for these questions. In a 7-point scale, representing 1 as the lowest and 7 as highest score, 44% of the respondents think their knowledge is higher than 4.

In terms of daily usage of economics, 45.2% of all participants say that they need little economy knowledge in their daily life, jobs, activities or hobbies.

Table 12. Self-assessed financial literacy

Variable	Category	Frequency	Percent
Self-economy assessment	1 - Very low	9	2.7
	2	21	6.4
	3	63	19.1
	4	91	27.6
	5	109	33.0
	6	28	8.5
	7 - Very high	9	2.7
Need of economy knowledge	Hardly ever	23	7.0
	Little	149	45.2
	Some	126	38.2
	A lot	32	9.7

Table 13 exhibits that the ratio of whether respondents have taken economy / finance and coding / programming courses during their education. While majority of the respondents have taken economy or finance course as a part of their education curriculum, on the other hand, only 36.4% of the respondents said that they have taken coding or programming course in their education.

Table 13. Economy and programming education

Variable	Category	Frequency	Percent
Economy / finance education	No	107	32.4
	Yes	223	67.6
Coding / programming education	No	210	63.6
	Yes	120	36.4

Figure 9 shows the sectoral distribution of questionnaire participants. 73.3% of the respondents marked one of the 15 listed sectors while 26.7% chosen other option. Among listed industries, 16.7% of the respondents work in finance sector. Information technologies follow finance with 13.6% and education has the third largest portion.

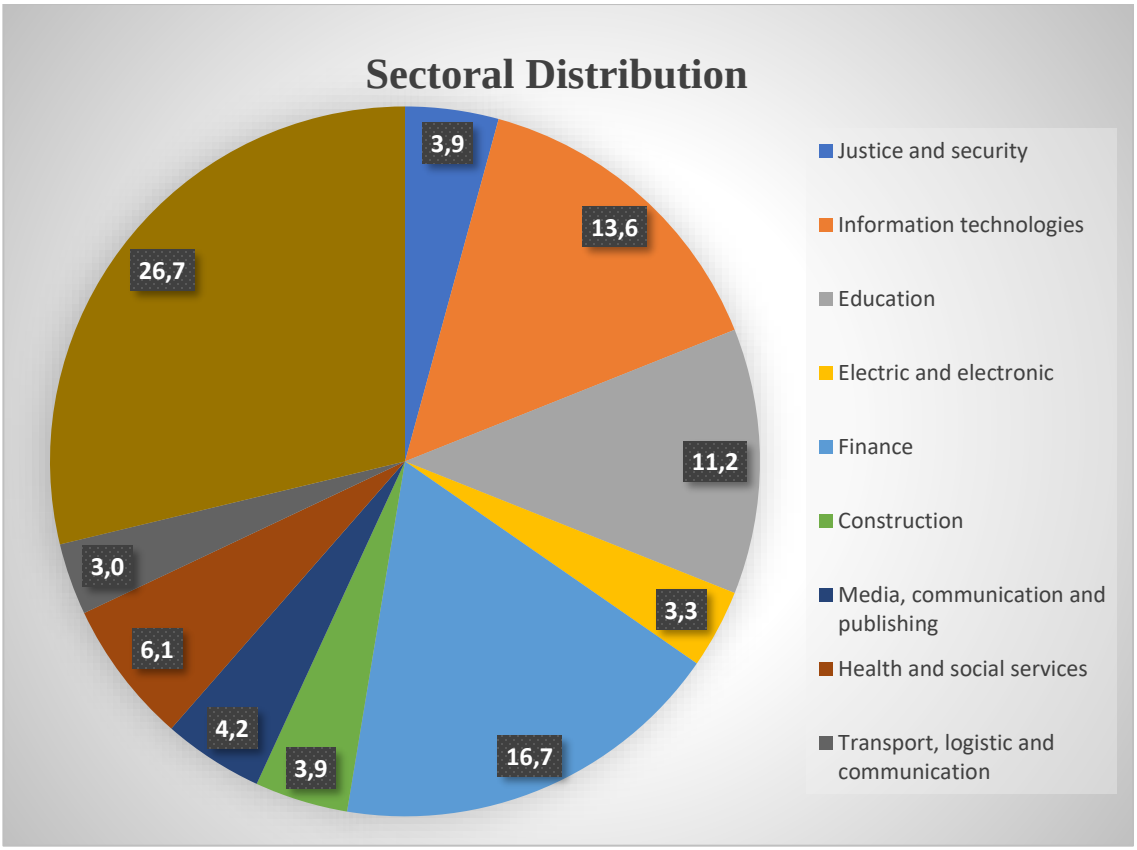

Figure 9. Sectoral distribution of respondents

5.2 Financial literacy (FL) answer analyses

As mentioned in section 4.3 Data cleaning, 280 respondents are aware of cryptocurrencies while 50 participants have not heard of cryptocurrencies. Financial literacy analyses which are frequencies and percentages of correct, incorrect, do not know answers, crosstab analyses assessing financial literacy quartiles for different variables and regression analyses were made for the sample of 280 respondents.

In the questionnaire, respondents were asked financial literacy questions including basic and advanced questions. Before analyzing these questions, we firstly performed factor analysis in order to specify basic and advanced questions. Dummy

variables were constructed for questions and variable was coded as 1 if the answer is correct and otherwise the variable was coded as 0.

Table 14 shows the results of the factor analysis for basic financial literacy questions and Kaiser-Meyer-Olkin measure gives that the sample is adequate with the score of 56 % for factor analysis. In addition, Bartlett's Test of Sphericity is significant and therefore data is distributed normally. The results show that the items can be grouped under one factor.

Table 14. Basic financial literacy questions factor analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.566
Bartlett's Test of Sphericity	Approx. Chi-Square	37.818
	Df	6
	Sig.	0.000

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.433	35.833	35.833	0.749	18.727	18.727
2	0.998	24.956	60.790			
3	0.857	21.430	82.219			
4	0.711	17.781	100.000			

Table 15 exhibits the factor loadings of basic financial literacy questions which are about properties of money, numeracy, inflation and time value of money.

Table 15: Factor loadings for basic financial literacy questions

	Factor loadings
Properties of money	0.268
Numeracy	0.314
Inflation	0.717
Time value of money	0.255

As advanced financial literacy questions, survey participants were asked 6 questions. The results of factor analysis for these 6 questions give that advanced financial literacy items can be grouped under two factors. In order to group items under one factor we withdrawn the question regarding risk diversification from the question set and then performed factor analysis with 5 advanced financial literacy questions.

Table 16 shows the results of the factor analysis for advanced financial literacy questions and Kaiser-Meyer-Olkin measure gives that the sample is adequate with the score of 71% for factor analysis. In addition, Bartlett's Test of Sphericity is significant and therefore data is distributed normally. The results show that the items can be grouped under one factor.

Table 16. Advanced financial literacy questions factor analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.711
Bartlett's Test of Sphericity	Approx. Chi-Square	161.335
	Df	10
	Sig.	0.000

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.053	41.059	41.059	1.361	27.222	27.222
2	0.990	19.803	60.861			
3	0.721	14.419	75.280			
4	0.652	13.048	88.328			
5	0.584	11.672	100.000			

Table 17 presents the factor loadings of advanced financial literacy questions which are about functions of stock market, properties of stocks, properties of bonds, fluctuation of asset yields and the relationship between interest rate and bond prices.

Table 17: Factor loadings for advanced financial literacy questions

	Factor loadings
Functions of stock market	0.582
Properties of stocks	0.452
Properties of bonds	0.576
Fluctuation of asset yields	0.622
Interest rate and bond price relationship	0.314

5.2.1 Basic financial literacy (BFL) answer analyses

Basic financial literacy questions aim to measure the understanding of basic financial concepts and simple mathematical calculations including properties of money, numeracy, inflation and time value of money.

Panel A in the Table 18 demonstrates ratio of question based correct, incorrect and do not know answers. Inflation question is answered correctly by nearly 90% of the respondents. On the other hand, 68.9% of the participants choose correct option for the question of properties of money.

Table 18. Basic financial literacy questions

Panel A: Proportion of question based correct, incorrect and do not know answers						
	Properties of money	Numeracy	Inflation	Time value of money		
Correct	68.9	78.2	89.3	86.8		
Incorrect	30.4	20.4	6.1	11.4		
Do not know	0.7	1.4	4.6	1.8		
Panel B: Distribution of the number of questions						
Number of correct, incorrect and do not know answers						
	None	1	2	3	All	Mean
Correct	1.8	2.5	13.9	34.3	47.5	3.23
Incorrect	48.9	36.4	13.2	0.4	1.1	0.68
Do not know	93.6	4.6	1.4	0.4	-	0.09

Panel B shows the proportion of the number of correct, incorrect and do not know answers. Among all respondents, 47.5% of them response all 4 questions and 34.3% of the participants answer 3 basic financial literacy questions correctly.

5.2.2 Advanced financial literacy (AFL) answer analyses

In addition to basic financial literacy questions measuring knowledge of simpler financial concepts, participants are also asked more sophisticated questions which are advanced financial literacy questions aiming to measure knowledge about stock markets, stocks, bonds, yields of various financial instruments and interest rate effects on bond price. Responses to these advanced financial literacy questions are reported in Table 19.

Table 19. Advanced financial literacy questions

Panel A: Proportion of question based correct, incorrect and do not know answers

	Correct	Incorrect	Do not know
Which of the following statements describes the main function of the stock market?	80.7	9.6	9.6
Someone buying the stock of company A on the stock exchange market;	83.2	10.4	6.4
Someone who buys a bond issued by company A;	61.4	18.6	20.0
Under normal conditions, which of the following asset yields the highest fluctuation over time?	74.6	14.6	10.7
If the interest rate falls, what happens to bond prices?	46.8	27.9	25.4

Panel B: Distribution of the number of questions

	Number of correct, incorrect and do not know answers						
	None	1	2	3	4	All	Mean
Correct	4.3	6.8	11.8	18.6	32.1	26.4	3.47
Incorrect	48.2	33.2	10.7	5.4	2.1	0.4	0.81
Do not know	65.7	14.3	9.6	5.0	3.2	2.1	0.72

The properties of stocks question has the highest correctly answer ratio with 83.7% among all advanced financial literacy questions. While most of the questions

were given correct responses individually, the rate of answering all questions correctly is low compared to basic financial literacy questions. Only 26.4% of participants give correct responses to all questions as shown in Panel B.

5.2.3 Crosstab analyses for financial literacy quartiles

Self-financial literacy assessments and demographics of respondents were analyzed in terms of financial literacy levels in this section. Before answering financial literacy questions, in the beginning of the questionnaire, participants were asked to assess their self-financial literacy knowledge over 7-point scale, as 1 is the lowest and 7 is the highest score. As reported in Table 20, self-financial literacy assessment is compatible with financial literacy quartiles measured through literacy questions. While respondents assessing their financial knowledge up to 4-point locate in lower quartiles, on the other hand, participants giving higher self-literacy scores themselves locate higher quartiles.

Table 20. Financial literacy quartiles across self-financial assessment

Self - assessed financial literacy	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
1 (very low)	66.7%	16.7%	0.0%	16.7%	6
2	64.7%	0.0%	23.5%	11.8%	17
3	59.6%	17.0%	12.8%	10.6%	47
4	41.3%	18.7%	32.0%	8.0%	75
5	29.3%	22.2%	26.3%	22.2%	99
6	28.6%	10.7%	21.4%	39.3%	28
7 (very high)	25.0%	12.5%	12.5%	50.0%	8
Chi-Square Tests					
	Value		Df	Asymptotic Significance (2-sided)	
Pearson Chi-Square	42.404		18	0.001	
Likelihood Ratio	44.885		18	0.000	
N of Valid Cases	280				

As indicated in Table 21, there is no obvious gender difference in terms of financial knowledge levels. The rates show similar pattern for both women and men. Chi-square test also shows that the difference is not significant.

Table 21. Financial literacy quartiles across gender

Gender	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Male	36.7%	18.9%	25.0%	19.4%	196
Female	48.8%	14.3%	21.4%	15.5%	84
Chi-Square Tests					
		Value	df	Asymptotic Significance (2-sided)	
Pearson Chi-Square		3.640	3	0.303	
Likelihood Ratio		3.616	3	0.306	
N of Valid Cases		280			

While there is no an obvious difference in terms of financial knowledge levels between men and women, Table 22 shows that there is a slight difference among different age groups according to Chi-square test result and in general, respondents locate mostly in lower quartiles.

Table 22. Financial literacy quartiles across age

Age Interval	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
18 – 25	60.4%	14.6%	14.6%	10.4%	48
25 – 35	35.8%	19.1%	22.8%	22.2%	162
35 – 45	30.6%	20.4%	34.7%	14.3%	49
More than 45	52.4%	4.8%	28.6%	14.3%	21
Chi-Square Tests					
		Value	df	Asymptotic Significance (2-sided)	
Pearson Chi-Square		18.208	9	0.033	
Likelihood Ratio		18.669	9	0.028	
N of Valid Cases		280			

Financial literacy of participants differs according to education levels. As indicated in Table 23, people with lower education degrees locate in lower quartiles

much more and ratio of people in higher financial quartiles increases as education levels increase.

Table 23. Financial literacy quartiles across education

Education	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
High school	81.3%	12.5%	0.0%	6.3%	16
Associate degree	60.0%	0.0%	20.0%	20.0%	5
Undergraduate	41.3%	19.2%	23.4%	16.2%	167
Graduate / doctorate	30.4%	16.3%	29.3%	23.9%	92
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square	19.136	9	0.024		
Likelihood Ratio	22.709	9	0.007		
N of Valid Cases	280				

Finance and economics education has significant impact on financial literacy as predicted and respondents taking finance and economics courses show higher literacy levels naturally as demonstrated in Table 24.

Table 24. Financial literacy quartiles across economics education

Economics education	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Taken	30.5%	18.2%	28.1%	23.2%	203
Not taken	66.2%	15.6%	13.0%	5.2%	77
Chi-Square Tests					
		Value	df	Asymptotic Significance (2-sided)	
Pearson Chi-Square		33.042	3	0.000	
Likelihood Ratio		34.732	3	0.000	
N of Valid Cases		280			

On the other hand, programming and coding education has no effect on financial literacy levels of people. As shown in Table 25, the difference between two groups is not

significant according to Chi-square test result and both groups show similar trends among literacy levels.

Table 25. Financial literacy quartiles across programming education

Coding education	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Taken	36.7%	18.3%	28.4%	16.5%	109
Not taken	42.7%	17.0%	21.1%	19.3%	171
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square	2.468	3	0.481		
Likelihood Ratio	2.450	3	0.484		
N of Valid Cases	280				

Economic conditions people live in are also determinant in financial literacy. Table 26 exhibits that the higher income people earn, the higher financial literacy quartile they have. While majority of people with lower income take a place in first and second quartiles, people earning higher monthly income mostly locate in upper quartiles such that none of the respondents earning more than 20000 TL monthly locate in first quartile.

Table 26. Financial literacy quartiles across monthly personal income

Income level	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Less than 3000 TL	50.0%	18.8%	18.8%	12.5%	48
3000 TL - 5000 TL	57.8%	20.3%	20.3%	1.6%	64
5000 TL - 10000 TL	32.0%	16.4%	24.6%	27.0%	122
10000 TL - 20000 TL	35.1%	13.5%	27.0%	24.3%	37
More than 20000 TL	0.0%	22.2%	55.6%	22.2%	9
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square	34.306	12	0.001		
Likelihood Ratio	42.494	12	0.000		
N of Valid Cases	280				

5.3 Cryptocurrency literacy (CL) answer analyses

In the questionnaire, respondents were asked 12 cryptocurrency literacy questions. Cryptocurrency literacy questions aim to measure participants' knowledge about basic fundamental concepts of cryptocurrencies through much more easier cryptocurrency literacy questions and more sophisticated concepts via more detailed questions. Before analyzing these questions, we firstly performed factor analysis in order to specify basic and advanced questions. Dummy variables were constructed for questions and variable was coded as 1 if the answer is correct and otherwise the variable was coded as 0.

Table 27 shows the results of the factor analysis for basic cryptocurrency literacy questions and Kaiser-Meyer-Olkin measure gives that the sample is adequate with the ratio of 80% for factor analysis. In addition, Bartlett's Test of Sphericity is significant and therefore data is distributed normally. The results show that the items can be grouped under one factor.

Table 27. Basic cryptocurrency literacy questions factor analysis

KMO and Bartlett's Test						
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.						0.805
Bartlett's Test of Sphericity			Approx. Chi-Square			319.041
			Df			15
			Sig.			0.000
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.651	44.189	44.189	2.028	33.799	33.799
2	0.945	15.756	59.945			
3	0.680	11.338	71.283			
4	0.637	10.611	81.894			
5	0.613	10.219	92.113			
6	0.473	7.887	100.000			

Table 28 presents the factor loadings of basic cryptocurrency literacy questions which are about working mechanism as transaction types, recording method, total supplies, government support, valuation and differences from traditional currencies.

Table 28. Factor loadings for basic cryptocurrency literacy questions

	Factor loadings
Cryptocurrencies allow direct transactions between the two parties without the need for a trusted third party to be involved.	0.621
While the total supply of some cryptocurrencies is fixed, some others' total supply is changeable	0.597
Unlike fiat currencies, cryptocurrencies are independent of a central authority, and encryption methods are used to manage currency generation and fund transfers.	0.695
Cryptocurrency transactions are recorded in publicly available distributed ledgers	0.477
Bitcoin was issued and supported by a government	0.666
Increase in the interest of social media and the public …..... the value of cryptocurrencies;	0.364

Table 29. Advanced cryptocurrency literacy questions factor analysis

KMO and Bartlett's Test						
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.						0.735
Bartlett's Test of Sphericity			Approx. Chi-Square			238.819
			df			15
			Sig.			0.000
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.297	38.279	38.279	1.683	28.053	28.053
2	0.981	16.346	54.625			
3	0.916	15.268	69.893			
4	0.779	12.982	82.875			
5	0.558	9.293	92.167			
6	0.470	7.833	100.000			

Table 29 shows the results of the factor analysis for advanced cryptocurrency literacy questions and Kaiser-Meyer-Olkin measure gives that the sample is adequate with the ratio of 73% for factor analysis. In addition, Bartlett's Test of Sphericity is significant and therefore data is distributed normally. The results show that the items can be grouped under one factor.

Table 30 presents factor loadings of more specific, technical and therefore more advanced cryptocurrency literacy questions regarding as transaction speed, risk diversification (Baumöhl, 2019), cyber-attack risk, differences between Proof of Work and Proof of Stake protocols and cryptocurrency wallet types.

Table 30. Factor loadings for advanced cryptocurrency literacy questions

	Factor loadings
Cryptocurrency transfer transactions take place instantaneously	0.302
Cryptocurrencies …..... portfolio risk due to low correlation between national currencies traded in Forex markets and cryptocurrencies	0.167
Cryptocurrencies working with Proof of Work (PoW) algorithm are more vulnerable to 51% attack risk	0.640
In the Proof of Stake (PoS) consensus algorithm, the cryptocurrency miner's computational power is determinant in resolving cryptographic puzzles that confirm the accuracy of transactions	0.501
Cryptocurrency wallets are divided into two as hot and cold wallets depending on whether or not they work with internet connection	0.581
In the Proof of Stake (PoS) consensus algorithm, only users with that cryptocurrency can verify the accuracy of the transactions and participate in the new block creation process.	0.752

5.3.1 Basic cryptocurrency literacy (BCL) answer analyses

Basic cryptocurrency literacy questions aim to measure respondents' knowledge with regard to basic cryptocurrency concepts including working mechanism, total supply, comparison to fiat currencies, transaction recording method and value formation.

Table 31. Basic cryptocurrency literacy questions

Panel A: Proportion of question based correct, incorrect and do not know answers								
	Correct		Incorrect		Do not know			
Cryptocurrencies allow direct transactions between the two parties without the need for a trusted third party to be involved.	75.0		8.2		16.8			
While the total supply of some cryptocurrencies is fixed, some others' total supply is changeable	65.7		6.1		28.2			
Unlike fiat currencies, cryptocurrencies are independent of a central authority, and encryption methods are used to manage currency generation and fund transfers.	83.6		1.8		14.6			
Cryptocurrency transactions are recorded in publicly available distributed ledgers	43.6		27.9		28.6			
Bitcoin was issued and supported by a government	80.7		3.2		16.1			
Increase in the interest of social media and the public ……..... the value of cryptocurrencies;	83.9		7.9		8.2			
Panel B: Distribution of the number of questions								
	None	1	2	3	4	5	All	Mean
Correct	3.6	6.1	6.1	10.4	15.0	30.4	28.6	4.33
Incorrect	57.9	31.8	8.2	1.8	0.4	-	-	0.55
Do not know	55.7	17.1	8.9	5.4	5.4	5.0	2.5	1.13

Panel A in the Table 31 shows that except from the question about transaction recording, other basic cryptocurrency literacy questions were answered correctly by majority of the respondents. However, since cryptocurrencies are new type of financial instruments, as expected, people are less knowledgeable even with basic cryptocurrency concepts compared to basic financial literacy subjects.

Table 31 also shows the weighted number of correct, incorrect and do not know answers. 28.6% of the respondents answering all 6 basic cryptocurrency literacy

questions correctly and the rate of respondents answering none of the questions correctly is 3.6%.

5.3.2 Advanced cryptocurrency literacy (ACL) answer analyses

In addition to basic cryptocurrency literacy questions measuring knowledge of fundamental cryptocurrency concepts, respondents were also asked advanced questions. Through advanced cryptocurrency literacy questions, it was aimed to measure respondents' knowledge about transaction speed, portfolio risk, 51% attack risk, Proof of Work and Proof of Stake algorithms and cryptocurrency wallets. Response results to advanced cryptocurrency literacy questions are reported in Table 32.

Highest correct response was given for cryptocurrency wallet question. 42.9% of the respondents answered correctly wallet question. On the other hand, only 6.8% of the participants answered Proof of Stake computational power question correctly.

Since advanced cryptocurrency literacy questions require sophisticated, detailed and technical knowledge, correct answer rates are very low. As reported in Panel B, only 1.4% of the respondents give correct answer to all questions while 36.9% of them answered none of the questions correctly.

Table 32. Advanced cryptocurrency literacy questions

Panel A: Proportion of question based correct, incorrect and do not know answers			
	Correct	Incorrect	Do not know
Cryptocurrency transfer transactions take place instantaneously	23.2	52.9	23.9
Cryptocurrencies …..... portfolio risk due to low correlation between national currencies traded in Forex markets and cryptocurrencies	22.5	37.5	40.0
Cryptocurrencies working with Proof of Work (PoW) algorithm are more vulnerable to 51% attack risk	20.0	5.7	74.3
In the Proof of Stake (PoS) consensus algorithm, the cryptocurrency miner's computational power is determinant in resolving cryptographic puzzles that confirm the accuracy of transactions	6.8	22.9	70.4
Cryptocurrency wallets are divided into two as hot and cold wallets depending on whether or not they work with internet connection	42.9	2.5	54.6
In the Proof of Stake (PoS) consensus algorithm, only users with that cryptocurrency can verify the accuracy of the transactions and participate in the new block creation process.	20.4	6.8	72.9

Panel B: Distribution of the number of questions								
	None	1	2	3	4	5	All	Mean
Correct	36.9	27.5	12.5	13.9	6.4	1.4	1.4	1.36
Incorrect	23.2	40.0	25.0	8.9	2.9	-	-	1.28
Do not know	13.2	8.9	7.1	15.7	23.3	17.9	13.9	3.36

5.3.3 Crosstab analyses for cryptocurrency literacy quartiles

Similar to financial literacy quartiles, cryptocurrency literacy quartiles were calculated through using total cryptocurrency scores including basic and advanced cryptocurrency scores. Cryptocurrency literacy quartiles analyzed in terms of self-financial literacy assessment. As reported in Table 33, cryptocurrency literacy scores are not perfectly aligned with self-assessment scores. Pearson Chi-square analysis also prove this result such that $p = .151$ and it is higher than reference level.

Table 33. Cryptocurrency literacy quartiles across self-financial assessment

Self - assessed financial literacy	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
1 (very low)	50.0%	16.7%	33.3%	0.0%	6
2	52.9%	23.5%	11.8%	11.8%	17
3	40.4%	34.0%	17.0%	8.5%	47
4	30.7%	26.7%	24.0%	18.7%	75
5	25.3%	37.4%	24.2%	13.1%	99
6	10.7%	42.9%	21.4%	25.0%	28
7 (very high)	0.0%	37.5%	37.5%	25.0%	8
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square	24.129[a]	18	0.151		
Likelihood Ratio	27.490	18	0.070		
N of Valid Cases	280				

Table 34 exhibits that cryptocurrency literacy differs between male and female. Women are low literate compared to men and while majority of women are in first and second quartiles, male respondents locate more homogenously.

Table 34. Cryptocurrency literacy quartiles across gender

Gender	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Female	50.0%	33.3%	14.3%	2.4%	84
Male	20.4%	33.2%	26.0%	20.4%	196
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square	33.920[a]	3	0.000		
Likelihood Ratio	37.235	3	0.000		
N of Valid Cases	280				

In the analysis evaluating the relationship between financial literacy quartiles and age groups, analysis results proved that there was no obvious difference among age groups in terms of financial literacy. However, cryptocurrency literacy shows a different pattern for different age intervals. While majority of younger participants who are less than 25 and most elderly people who are higher than 45 locate in lower cryptocurrency

literacy quartiles, however, people between age of 25 and 45 disperse more regularly between cryptocurrency literacy quartiles compared to other age groups.

Table 35. Cryptocurrency literacy quartiles across age

Age Interval	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
18 - 25	35.4%	27.1%	20.8%	16.7%	48
25 - 35	25.9%	38.3%	23.5%	12.3%	162
35 - 45	26.5%	22.4%	24.5%	26.5%	49
More than 45	47.6%	33.3%	14.3%	4.8%	21
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square	14.780[a]	9	0.092		
Likelihood Ratio	14.443	9	0.107		
N of Valid Cases	280				

Analysis between education degrees and cryptocurrency literacy quartiles proves that there is no significant difference between education levels. Chi-square test in Table 36 shows that $p = .293$ which is higher than significance level.

Table 36. Cryptocurrency literacy quartiles across education

Education	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
High school	56.3%	18.8%	18.8%	6.3%	16
Associate degree	20.0%	20.0%	20.0%	40.0%	5
Undergraduate	30.5%	34.1%	21.6%	13.8%	167
Graduate / doctorate	22.8%	34.8%	25.0%	17.4%	92
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square	10.755[a]	9	0.293		
Likelihood Ratio	9.820	9	0.365		
N of Valid Cases	280				

Table 37 exhibits that there is a significant relationship between finance education and cryptocurrency literacy since Chi-square value is less than reference level

as $p = .004$. Finance and economics education has significant impact on cryptocurrency literacy distribution and respondents taking finance and economics courses show higher literacy levels.

Table 37. Cryptocurrency literacy quartiles across economics education

Economics education	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Taken	23.6%	37.9%	23.2%	15.3%	203
Not taken	44.2%	20.8%	20.8%	14.3%	77
Chi-Square Tests					
		Value	df	Asymptotic Significance (2-sided)	
Pearson Chi-Square		13.140	3	0.004	
Likelihood Ratio		13.004	3	0.005	
N of Valid Cases		280			

Programming and coding education also has effect on financial literacy levels of people. As shown in Table 38, the difference between two groups is significant with the Chi-square value as $p < .001$. People taking programming and coding education have higher cryptocurrency literacy and there is a strong relationship between programming education and cryptocurrency literacy.

Table 38. Cryptocurrency literacy quartiles across coding education

Coding education	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Taken	17.4%	33.0%	25.7%	23.9%	109
Not taken	36.8%	33.3%	20.5%	9.4%	171
Chi-Square Tests					
		Value	df	Asymptotic Significance (2-sided)	
Pearson Chi-Square		18.699	3	0.000	
Likelihood Ratio		19.021	3	0.000	
N of Valid Cases		280			

Table 39 reports the significance value as $p = .030$ which is lower than significance level and the relationship between income levels and cryptocurrency literacy is significant. Thus, there is a significant difference among different income levels in terms of cryptocurrency literacy quartiles.

Table 39. Cryptocurrency literacy quartiles across monthly personal income

Income level	First Quartile	Second Quartile	Third Quartile	Fourth Quartile	N
Less than 3000 TL	35.4%	22.9%	16.7%	25.0%	48
3000 TL - 5000 TL	37.5%	28.1%	21.9%	12.5%	64
5000 TL - 10.000 TL	26.2%	41.0%	23.8%	9.0%	122
10000 TL - 20000 TL	18.9%	32.4%	29.7%	18.9%	37
More than 20000 TL	22.2%	22.2%	11.1%	44.4%	9

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.736	12	0.030
Likelihood Ratio	21.141	12	0.048
N of Valid Cases	280		

5.4 Cryptocurrency participation analyses

In the previous sections, financial literacy and cryptocurrency literacy quartiles were analyzed in terms of various variables defining respondents. In this section, crosstab analyses and binary logistic regression analyses were performed in order to examine the relationship between cryptocurrency participation and literacy of people.

Cryptocurrency participation is handled with different angles. Cryptocurrency purchase is considered one of the main indicators for participation. Another method is to perform mining or minting activities to obtain cryptocurrencies. We also asked participants whether they have currently own cryptocurrencies or not. Lastly, even

though they have not purchased, mined, minted before, whether they think of obtain cryptocurrencies in the future.

The effects or contributions of financial literacy and cryptocurrency literacy on these factors regarded as indicator of cryptocurrency participation were analyzed and the relationship between literacy and participation evaluated.

Figure 10 gives the summary of responses regarding the reasons for why people adopt cryptocurrencies. Being interested in new technologies, making investment and earning income by trading are the most preferred choices by respondents.

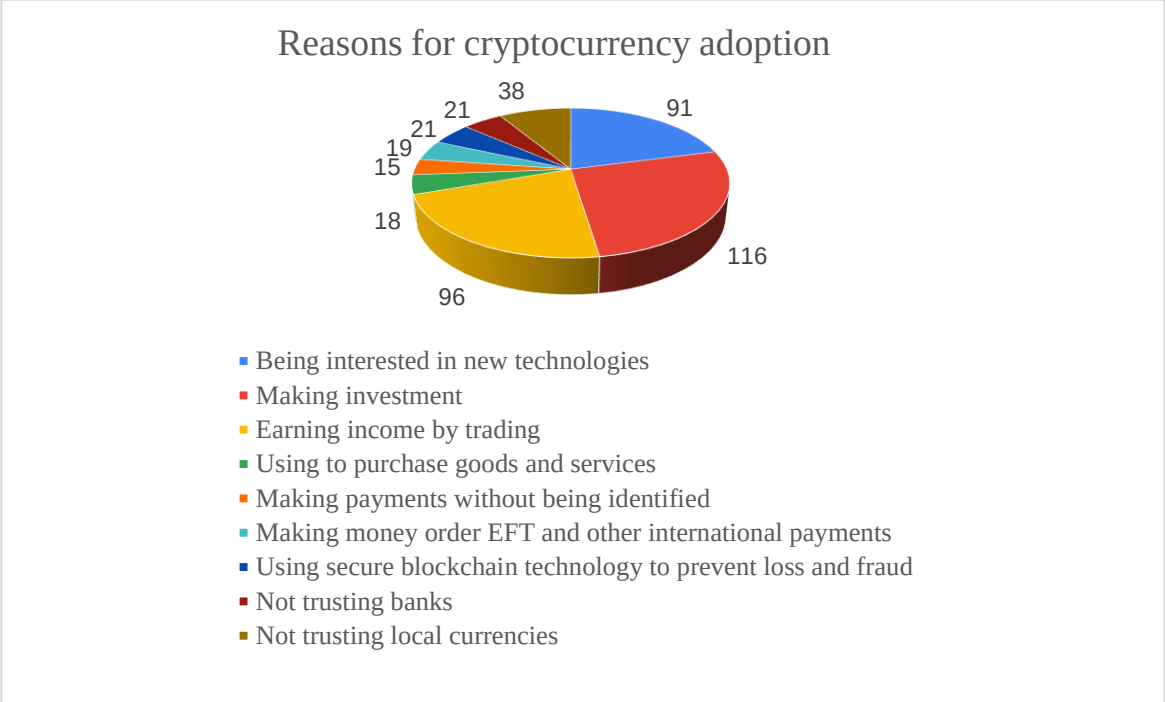

Figure 10. Reasons for cryptocurrency adoption

On the other hand, Figure 11 shows the reasons for why respondents do not prefer to adopt cryptocurrencies. Not guaranteed by any state or central bank, being difficult to understand the technology behind it, concerns about cyber theft and concerns about being out of the surveillance of regulatory agencies are the main reasons for not adopting cryptocurrencies.

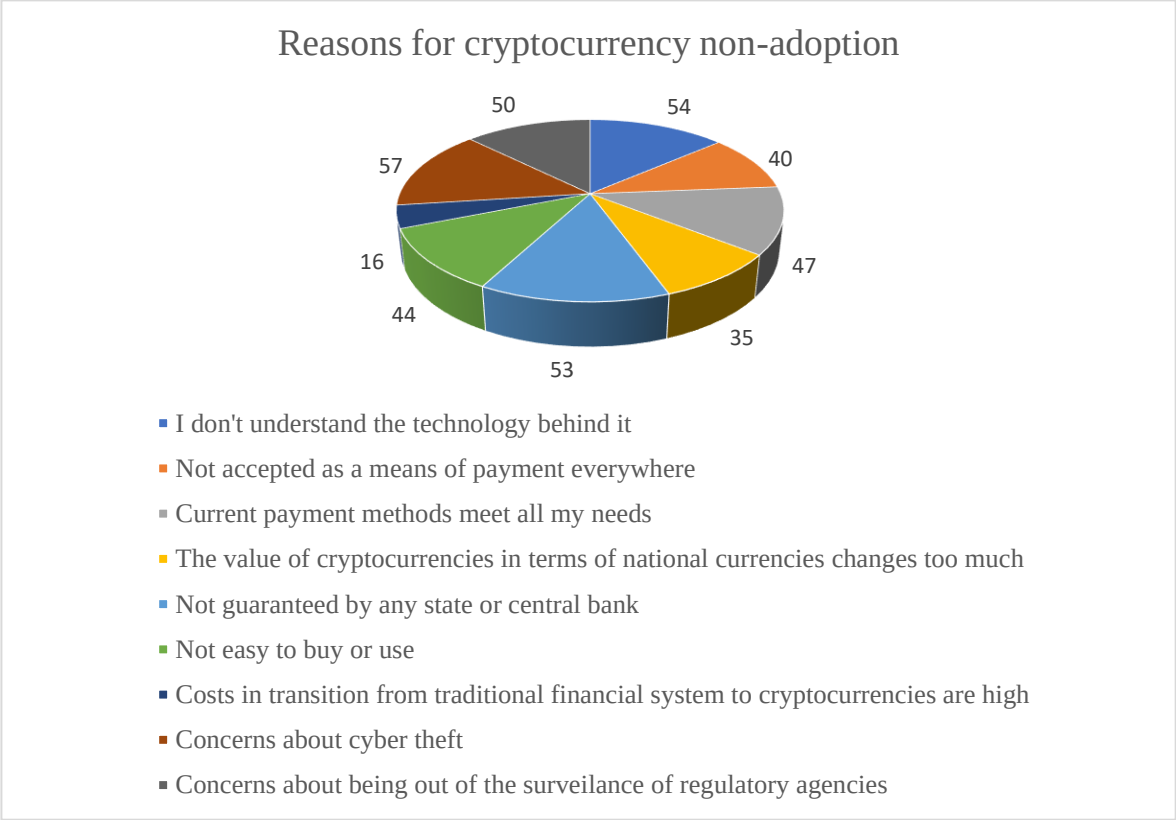

Figure 11. Reasons for cryptocurrency non-adoption

The correlation table of variables in the research is displayed in Appendix C. The table shows significant correlations at 0.05 level and 0.01 level among variables.

5.4.1 Cryptocurrency purchase behavior

In order to expose whether or not financial literacy affects cryptocurrency purchase behavior, crosstab analysis and regression analysis were performed and cryptocurrency purchase behavior was evaluated in terms of financial literacy levels.

Table 40 shows cryptocurrency purchase across gender, marital status, different age groups, education levels, income levels, financial literacy levels and cryptocurrency literacy levels. As reported in the table below, cryptocurrency purchase is much more common among men compared to women. While 50.4% the married respondents purchased cryptocurrencies, 37.9% of the single respondents purchased them. Cryptocurrency purchase is concentrated among people between the ages of 25 and 45. The lowest proportion of cryptocurrency purchase is for the respondents older than 45.

Cryptocurrency purchase increases with education level such that only 25% of the respondents with high school degree purchased cryptocurrencies while this ratio is 50% for graduate or doctorate degree ones. Cryptocurrency purchase increases strongly with personal income. However, same trend is not correct for household income levels.

While cryptocurrency purchase is concentrated among second and third financial literacy quartiles, the rate of cryptocurrency purchase increases strongly as cryptocurrency literacy levels increase. As shown in the Table 40, while only 15.9% of the respondents in the first cryptocurrency literacy quartile purchased cryptocurrencies, this ratio is 81.0% for the respondents in the fourth quartile.

Table 40. Cryptocurrency purchase across subgroups

Gender		**Marital Status**	
Female	21.4%	Single	37.9%
Male	52.6%	Married	50.4%
Age interval		**Education degree**	
18 - 25 years	31.3%	High school	25.0%
25 - 35 years	49.4%	Associate degree	40.0%
35 - 45 years	44.9%	Undergraduate	41.3%
More than 45 years	19.0%	Graduate / doctorate	50.0%
Economics education		**Coding education**	
Not taken	40.3%	Not taken	42.1%
Taken	44.3%	Taken	45.0%
Personal income		**Household income**	
Less than 3000 TL	37.5%	Less than 3000 TL	50.0%
3000 TL - 5000 TL	39.1%	3000 TL - 5000 TL	43.9%
5000 TL - 10000 TL	43.4%	5000 TL - 10000 TL	41.0%
1.000 TL - 20000 TL	54.1%	1.000 TL - 20000 TL	44.6%
More than 20000 TL	55.6%	More than 20000 TL	41.9%
Financial literacy quartiles		**Cryptocurrency literacy quartiles**	
First quartile	32.7%	First quartile	15.9%
Second quartile	57.1%	Second quartile	35.5%
Third quartile	50.7%	Third quartile	65.1%
Fourth quartile	43.1%	Fourth quartile	81.0%

Before making logistic regression analyses, categorical independent variables were coded as dummy variable. Similarly, age, education degree, personal income and household income variables were separated into two categories according to distribution of sub-categories and these variables were coded as dummy variable and then regression analyses were performed.

The logistic regression analyses in the research include 5 various model. Model 1 analyzes the effect of demographic variables in terms of cryptocurrency participation.

While Model 2 analyzes demographic variables and basic financial literacy index together, Model 3 analyzes demographics and advanced financial literacy index. In the Model 4, demographics and basic cryptocurrency literacy index are analyzed. Lastly Model 5 analyzes demographics and advanced cryptocurrency literacy index in order to analyze the effect of these factors on cryptocurrency purchase behavior.

While handling blocks of independent variables in the regression analyses, enter method was applied and all independent variables were entered into equation in one step.

Table 41 gives observed and predicted cases for cryptocurrency purchase behavior. While Model 1 analyzing demographic variables classifies 67.1% correctly, Model 2 analyzing both demographic and basic financial literacy index classifies 67.5% correctly the purchase behavior. On the other hand, Model 3 including demographics and advanced financial literacy index classifies correctly purchase behavior with 70.0%. Model 4 including demographics and basic cryptocurrency literacy index classifies 73.6% correctly. Lastly, Model 5 analyzing demographics and advanced cryptocurrency literacy index classifies purchase behavior correctly with 72.5%.

Omnibus Tests of Model Coefficients part exhibits that the explanatory variables are significant for all models because *p*-value is under the reference value in all models.

The model summary part of the table gives R square values. According to Nagelkerke R Square values, Model 1 and Model 2 predicts 18 % of the change in dependent variable by independent variables. This ratio is 20 % in Model 3 and 34 % in Model 4 and Model 5.

Table 41. Classification table for cryptocurrency purchase behavior

Have you ever purchased any cryptocurrency?															
	Model 1			Model 2			Model 3			Model 4			Model 5		
Predicted Observed	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct
No	118	41	74.2	117	42	73.6	122	37	76.7	119	40	74.8	127	32	79.9
Yes	51	70	57.9	49	72	59.5	47	74	61.2	34	87	71.9	45	76	62.8
Overall Percentage			67.1			67.5			70.0			73.6			72.5
Omnibus Tests of Model Coefficients															
Chi-square	40.608			41.450			46.035			82.624			82.763		
df	10			11			11			11			11		
Sig. level	0.000			0.000			0.000			0.000			0.000		
Model Summary															
Cox & Snell R Square	0.135			0.138			0.152			0.256			0.256		
Nagelkerke R Square	0.181			0.185			0.203			0.343			0.343		

Table 42 shows the variable analyses in models in terms of cryptocurrency purchase decision. In the Model 1 analyzing demographic variables, gender, age and marital status are significant variables with the *p*-values which are lower than significant level of 0.05.

The base group was regarded as female in gender variable and the *B*-value in the analysis result for gender is -1.241. Therefore, it can be concluded that men are much more active in cryptocurrency purchase, on the other hand while passing from male to female, cryptocurrency purchase decision shows an adverse trend. The gender variable shows similar attitudes in all other models as well and gender is significant in these models.

Similar to Model 1, age variable is significant in all other models, except from Model 2. The base group was determined as age less than 35 and *B*-values are positive in all models. Hence, it can be concluded that people who less than 35 purchase cryptocurrencies much more compared to others.

The base group was regarded as married in marital status variable. Except from Model 3 analyzing the effect of advanced financial literacy and Model 5 analyzing the effect of advanced cryptocurrency literacy, marital status is significant in remaining models with positive *B*-values. Thus, it can be deducted that married people purchase cryptocurrencies much more compared to single ones and the effect of marital status diminishes when we control for advanced financial literacy in Model 3 and advanced cryptocurrency literacy in Model 5.

Model 2 analyzes the effect of basic financial literacy together with demographics on cryptocurrency purchase behavior and analysis results show that there is no significant impact of basic financial literacy on cryptocurrency purchase decision.

On the other hand, according to analysis results, when financial literacy level increase from basic to advanced, this has an impact on purchase decision as $p = .022$ which is under the significance level in Model 3 analyzing the effect of advanced financial literacy together with demographics.

Model 4 demonstrates that basic cryptocurrency literacy affects cryptocurrency purchase behavior because $p < .001$ for basic cryptocurrency literacy index which is under the significance level and *B*-value is positive. Similarly, analysis results of Model 5 exhibit that advanced cryptocurrency literacy has an influence on cryptocurrency purchase with significant *p*-value and positive *B*-value. Thus, both basic cryptocurrency literacy and advanced cryptocurrency literacy positively impact the behavior of cryptocurrency purchase.

Table 42. Variable analysis for cryptocurrency purchase behavior

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Female	-1.241	0.000	-1.223	0.000	-1.220	0.000	-0.727	0.037	-1.108	0.001
Age (less than 35)	0.661	0.043	0.639	0.051	0.750	0.025	0.724	0.047	1.091	0.003
Married	0.595	0.040	0.582	0.046	0.561	0.056	0.843	0.009	0.480	0.121
Education (Undergraduate)	-0.322	0.282	-0.308	0.304	-0.312	0.302	-0.273	0.405	-0.414	0.205
Personal income less than 5000 TL	-0.286	0.376	-0.256	0.430	-0.089	0.791	-0.121	0.726	-0.689	0.055
Household income less than 10000 TL	0.301	0.335	0.284	0.365	0.177	0.580	0.377	0.259	0.328	0.332
Economics / finance education	-0.177	0.585	-0.214	0.513	-0.420	0.222	-0.448	0.210	-0.218	0.540
Coding / programming education	-0.003	0.993	-0.028	0.921	0.040	0.889	-0.369	0.227	-0.389	0.217
Daily use of economics (Little)	-0.517	0.069	-0.499	0.080	-0.547	0.058	-0.579	0.058	-0.403	0.191
Self-assessed literacy	0.137	0.269	0.136	0.272	0.095	0.453	0.088	0.505	0.080	0.550
Basic financial literacy index			0.100	0.366						
Advanced financial literacy index					0.300	0.022				
Basic cryptocurrency literacy index							1.041	0.000		
Advanced cryptocurrency literacy index									0.873	0.000
Constant	-0.748	0.344	-0.714	0.365	-0.480	0.552	-0.755	0.377	-0.471	0.584

5.4.2 Cryptocurrency mining behavior

Cryptocurrency mining or minting activities are other ways of cryptocurrency participation. Only 27 participants over 280 perform mining or minting activities.

Table 43 shows cryptocurrency mining across gender, marital status, different age groups, education levels, income levels, financial literacy levels and cryptocurrency literacy levels. As reported in the table, cryptocurrency mining is very rare in all variables and variable levels. Men are more active in cryptocurrency mining compared to women. While 13.4% the married respondents mined cryptocurrencies, 6.8% of the single respondents participated mining activities. The highest mining ratio among age intervals is in the group of 35-45 with 18.4%.

Cryptocurrency mining is highest among the respondents with high school degree with 18.8%. This ratio is around 9% for the respondents who have at least undergraduate degree. Economics education has an inverse effect on cryptocurrency mining because respondents taking economics education participate less in mining activities compared to the people who did not take economics education. On the other hand, coding education positively affects cryptocurrency mining.

Cryptocurrency purchase increases with personal income in general. After second level, mining rates show increases for every upper personal income level and one third of the respondents who earn more than 20000 TL perform mining activities.

Cryptocurrency mining reaches its highest ratio in third financial literacy quartiles. On the other hand, even if the rate of cryptocurrency mining rises as

cryptocurrency literacy level increases, only 23.8% of the respondents in the fourth cryptocurrency literacy quartile perform cryptocurrency mining.

Table 43. Cryptocurrency mining/minting across subgroups

Gender		**Marital Status**	
Female	4.8%	Not married	6.8%
Male	11.7%	Married	13.4%
Age interval		**Education degree**	
18 - 25 years	8.3%	High school	18.8%
25 - 35 years	7.4%	Associate degree	0.0%
35 - 45 years	18.4%	Undergraduate	9.0%
More than 45 years	9.5%	Graduate / doctorate	9.8%
Economics education		**Coding education**	
Not taken	14.3%	Not taken	7.6%
Taken	7.9%	Taken	12.8%
Personal income		**Household income**	
Less than 3000 TL	8.3%	Less than 3000 TL	0.0%
3000 TL - 5000 TL	7.8%	3000 TL - 5000 TL	9.8%
5000 TL - 10000 TL	8.2%	5000 TL - 10000 TL	9.0%
1.000 TL - 20000 TL	13.5%	1.000 TL - 20000 TL	10.9%
More than 20000 TL	33.3%	More than 20000 TL	12.9%
Financial literacy quartiles		**Cryptocurrency literacy quartiles**	
First quartile	10.6%	First quartile	1.2%
Second quartile	4.1%	Second quartile	5.4%
Third quartile	14.9%	Third quartile	17.5%
Fourth quartile	5.9%	Fourth quartile	23.8%

In addition to crosstab analysis, cryptocurrency participation through cryptocurrency mining or minting activities was analyzed via binary logistic regression analysis.

The logistic regression analysis for mining/minting activities, similar to purchase analyses include 5 various model. Model 1 analyzes the effect of demographic variables

in terms of cryptocurrency participation through mining/minting activities. While Model 2 analyzes demographic variables and basic financial literacy index together, Model 3 analyzes demographics and advanced financial literacy index. In the Model 4, demographics and basic cryptocurrency literacy index are analyzed. Lastly Model 5 analyzes demographics and advanced cryptocurrency literacy index in order to analyze the effect of these factors on cryptocurrency mining/minting activities.

Table 44 gives observed and predicted cases for cryptocurrency mining/minting behavior. Both Model 1 analyzing demographic variables and Model 2 analyzing both demographic and basic financial literacy index correctly classify mining /minting behavior with 90.7%. On the other hand, Model 3 including demographics and advanced financial literacy index classifies correctly mining/minting behavior with 91.1%. Both Model 4 including demographics and basic cryptocurrency literacy index and Model 5 analyzing demographics and advanced cryptocurrency literacy index classifies mining/minting behavior correctly with 90.4%.

Omnibus Tests of Model Coefficients part exhibits that the explanatory variables are significant for all mining/minting models because *p*-value is under the reference value of .05 in all models.

The model summary part of the Table 44 gives R-square values. According to Nagelkerke R-Square values, Model 1 and Model 2 predicts 15% of the change in dependent variable by independent variables. This ratio is 16% in Model 3, 19% in Model 4 and 23% in Model 5.

Table 44. Classification table for cryptocurrency mining/minting behavior

Have you ever done cryptocurrency mining or minting?															
	Model 1			Model 2			Model 3			Model 4			Model 5		
Predicted Observed	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct
No	253	0	100	253	0	100	253	0	100	256	1	99.6	251	2	99.2
Yes	26	1	3.7	26	1	3.7	25	2	7.4	26	1	3.7	25	2	7.4
Overall Percentage			90.7			90.7			91.1			90.4			90.4
Omnibus Tests of Model Coefficients															
Chi-square	21.162			21.611			23.204			26.440			32.896		
df	10			11			11			11			11		
Sig. level	0.020			0.028			0.017			0.006			0.001		
Model Summary															
Cox & Snell R Square	0.073			0.074			0.080			0.090			0.111		
Nagelkerke R Square	0.155			0.158			0.169			0.192			0.236		

Table 45 shows the significance analyses of variables in models in terms of cryptocurrency mining/minting behavior. In the Model 1 analyzing demographic variables, the only significant variable is the economics/finance education variable since $p = .016$ which is lower than significant level. The base group was regarded as educated in the variable and the *B*-value is -1.203 in the analysis result for this variable. Therefore, it can be concluded that respondents who took economics / finance course are less active in cryptocurrency mining/minting activities, The economics / finance education variable shows similar attitudes in all remaining models and similar to Model 1, people without economics/finance education are more inclined to do cryptocurrency mining/minting activities compared to educated ones.

Model 2 analyzes the effect of basic financial literacy on cryptocurrency mining/minting behavior and analysis results show that there is no significant relationship between basic financial literacy and cryptocurrency mining/minting. According to analysis results, even if financial literacy levels increase from basic to advanced, this does not affect the behavior of cryptocurrency mining/minting because advanced financial literacy index is not significant Model 3.

On the other hand, Model 4 exhibits that basic cryptocurrency literacy affects cryptocurrency mining since $p = .047$ for basic cryptocurrency literacy index which is under the significance level and $B = 0.604$ which is positive. Similarly, analysis results of Model 5 exhibit that advanced cryptocurrency literacy has an influence on cryptocurrency mining/minting as $p = .001$ and $B = 0.594$. Thus, both basic cryptocurrency literacy and advanced cryptocurrency literacy positively impact the behavior of cryptocurrency mining/minting.

Table 45. Variable analysis for cryptocurrency mining/minting behavior

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Female	-0.772	0.189	-0.811	0.172	-0.854	0.151	-0.452	0.464	-0.433	0.482
Age (less than 35)	-0.793	0.096	-0.758	0.114	-0.922	0.058	-0.837	0.087	-0.556	0.265
Married	0.615	0.200	0.647	0.180	0.700	0.146	0.592	0.226	0.488	0.328
Education (Undergraduate)	0.431	0.398	0.409	0.424	0.494	0.341	0.473	0.362	0.449	0.393
Personal income less than 5000 TL	-0.159	0.775	-0.193	0.730	-0.355	0.538	-0.118	0.832	-0.509	0.382
Household income less than 10000 TL	-0.227	0.662	-0.203	0.697	-0.116	0.827	-0.230	0.662	-0.288	0.596
Economics / finance education	-1.203	0.016	-1.175	0.019	-1.024	0.046	-1.275	0.011	-1.318	0.011
Coding / programming education	0.856	0.061	0.891	0.054	0.867	0.060	0.654	0.159	0.388	0.437
Daily use of economics (Little)	-0.145	0.760	-0.170	0.723	-0.159	0.740	-0.110	0.820	0.030	0.951
Self-assessed literacy	0.400	0.058	0.400	0.059	0.436	0.040	0.351	0.090	0.361	0.097
Basic financial literacy index			-0.112	0.490						
Advanced financial literacy index					-0.277	0.147				
Basic cryptocurrency literacy index							0.604	0.047		
Advanced cryptocurrency literacy index									0.594	0.001
Constant	-3.262	0.017	-3.304	0.017	-3.541	0.011	-3.147	0.022	-3.135	0.023

5.4.3 Cryptocurrency ownership

Cryptocurrency participation was also analyzed in terms of currently cryptocurrency ownership. Similar to analysis results regarding cryptocurrency purchase, current cryptocurrency ownership analyses in terms of financial literacy quartiles and cryptocurrency quartiles give similar results.

Table 46 shows cryptocurrency ownership across gender, marital status, different age groups, education levels, income levels, financial literacy levels and cryptocurrency literacy levels. As reported in the table below, cryptocurrency purchase is much more common among men compared to women. While 47.1% the married respondents own cryptocurrencies, 25.5% of the single respondents have them. Cryptocurrency ownership is concentrated among people between the ages of 25 and 45. The lowest proportion of current ownership is for the respondents older than 45.

Cryptocurrency ownership does not show a regular increase with education level. The highest current ownership rate is for the respondents with associate degree with the rate of 40.0%

People personally earning between 10000 TL and 20000 TL monthly have higher current ownership rate such that more than half of them have cryptocurrencies currently.

Current cryptocurrency ownership does not differ so much among financial literacy quartiles and there is only 12% difference between lowest and highest quartiles. However, the rate of cryptocurrency ownership increases strongly as cryptocurrency literacy levels increase. As shown in the Table 46, while only 11.0% of the respondents in the first cryptocurrency literacy quartile currently own cryptocurrencies, this ratio is 71.4% for the respondents in the fourth quartile.

Table 46. Current cryptocurrency ownership across subgroups

Gender		**Marital Status**	
Female	16.7%	Not married	25.5%
Male	42.3%	Married	47.1%
Age interval		**Education degree**	
18 - 25 years	29.2%	High school	31.3%
25 - 35 years	37.7%	Associate degree	40.0%
35 - 45 years	38.8%	Undergraduate	32.9%
More than 45 years	14.3%	Graduate / doctorate	38.0%
Economics education		**Coding education**	
Not taken	36.4%	Not taken	35.7%
Taken	34.0%	Taken	33.0%
Personal income		**Household income**	
Less than 3000 TL	33.3%	Less than 3000 TL	37.5%
3000 TL - 5000 TL	32.8%	3000 TL - 5000 TL	41.5%
5000 TL - 10000 TL	31.1%	5000 TL - 10000 TL	29.0%
1.000 TL - 20000 TL	51.4%	1.000 TL - 20000 TL	39.1%
More than 20000 TL	33.3%	More than 20000 TL	29.0%
Financial literacy quartiles		**Cryptocurrency literacy quartiles**	
First quartile	29.2%	First quartile	11.0%
Second quartile	38.8%	Second quartile	28.0%
Third quartile	35.8%	Third quartile	50.8%
Fourth quartile	41.2%	Fourth quartile	71.4%

In addition to crosstab analysis, cryptocurrency participation through currently cryptocurrency ownership was analyzed via binary logistic regression test.

The logistic regression analysis for current cryptocurrency ownership includes 5 various model. Model 1 analyzes the effect of demographic variables in terms of cryptocurrency ownership. While Model 2 analyzes demographic variables and basic financial literacy index together, Model 3 analyzes demographics and advanced financial literacy index. In the Model 4, demographics and basic cryptocurrency literacy index are

analyzed. Lastly Model 5 analyzes demographics and advanced cryptocurrency literacy index in order to analyze the effect of these factors on current cryptocurrency ownership.

Table 47 gives observed and predicted cases for cryptocurrency purchase behavior. Model 1 analyzing demographic variables and Model 2 analyzing both demographic and basic financial literacy index classifies 73.4% correctly current ownership. On the other hand, Model 3 including demographics and advanced financial literacy index classifies correctly current cryptocurrency ownership with 74.6%. Model 4 including demographics and basic cryptocurrency literacy index classifies 77.5% correctly. Lastly, Model 5 analyzing demographics and advanced cryptocurrency literacy index classifies current cryptocurrency ownership correctly with 76.4%.

Omnibus Tests of Model Coefficients part exhibits that the explanatory variables are significant for all models because *p*-value is under the reference value of 0.05 in all models.

The model summary part of the table gives R square values. According to Nagelkerke R Square values, Model 1 and Model 2 predicts 18% of the change in dependent variable by independent variables. This ratio is 21% in Model 3, 36% in Model 4 and 34% in Model 5.

Table 47. Classification table for current cryptocurrency ownership

Currently do you own any cryptocurrency?															
	Model 1			Model 2			Model 3			Model 4			Model 5		
Predicted / Observed	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct
No	165	18	90.2	166	17	90.7	162	21	88.5	163	20	89.1	159	24	86.9
Yes	56	41	42.3	57	40	41.2	50	47	48.5	43	54	55.7	42	55	56.7
Overall Percentage			73.6			73.6			74.6			77.5			76.4
Omnibus Tests of Model Coefficients															
Chi-square	40.851			40.915			46.670			85.769			81.673		
df	10			11			11			11			11		
Sig. level	0.000			0.000			0.000			0.000			0.000		
Model Summary															
Cox & Snell R Square	0.136			0.136			0.154			0.264			0.253		
Nagelkerke R Square	0.187			0.188			0.212			0.364			0.349		

Table 48 shows the variable analyses in models in terms of current cryptocurrency ownership. In the Model 1 analyzing demographic variables, gender and marital status are significant variables with the p-values which are lower than significant level of 0.05.

The base group was regarded as female in gender variable and the B = -1.275. Therefore, it can be concluded that men are much more active in cryptocurrency ownership, on the other hand while passing from male to female, cryptocurrency ownership shows an adverse trend. The gender variable shows similar attitudes in all other models except from Model 4 analyzing the effect of basic cryptocurrency literacy. Hence, the gender effect in cryptocurrency ownership diminishes when basic cryptocurrency literacy is controlled in Model 4.

Similar to Model 1, marital status variable is significant in all other models. The base group was regarded as married in marital status variable and *B*-values are positive in all models. Thus, it can be deducted that married people own cryptocurrencies much more compared to single ones.

Model 2 analyzes the effect of basic financial literacy together with demographics on cryptocurrency purchase behavior and analysis results show that there is no significant impact of basic financial literacy on current cryptocurrency ownership.

On the other hand, according to analysis results, when financial literacy level increase from basic to advanced, this has an impact on cryptocurrency ownership because p = .019 which is under the significance level in Model 3 analyzing the effect of advanced financial literacy together with demographics.

Table 48. Variable analysis for current cryptocurrency ownership

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Female	-1.275	0.000	-1.267	0.000	-1.243	0.000	-0.640	0.095	-1.108	0.003
Age (less than 35)	0.620	0.068	0.615	0.072	0.737	0.036	0.730	0.059	1.088	0.005
Married	1.066	0.000	1.062	0.000	1.047	0.001	1.402	0.000	1.025	0.001
Education (Undergraduate)	-0.090	0.771	-0.086	0.782	-0.072	0.818	0.003	0.994	-0.132	0.697
Personal income less than 5000 TL	0.043	0.900	0.051	0.883	0.264	0.460	0.228	0.534	-0.371	0.331
Household income less than 10000 TL	0.032	0.923	0.028	0.931	-0.104	0.755	0.136	0.701	0.030	0.932
Economics / finance education	-0.315	0.351	-0.325	0.339	-0.577	0.108	-0.606	0.108	-0.379	0.305
Coding / programming education	-0.132	0.654	-0.139	0.638	-0.088	0.768	-0.534	0.096	-0.632	0.063
Daily use of economics (Little)	-0.580	0.052	-0.575	0.055	-0.625	0.040	-0.643	0.046	-0.468	0.149
Self-assessed literacy	0.058	0.653	0.058	0.657	0.013	0.925	-0.002	0.987	-0.029	0.836
Basic financial literacy index			0.029	0.801						
Advanced financial literacy index					0.331	0.019				
Basic cryptocurrency literacy index							1.218	0.000		
Advanced cryptocurrency literacy index									0.848	0.000
Constant	-0.948	0.252	-0.939	0.256	-0.694	0.413	-1.137	0.211	-0.644	0.471

In spite of the fact that age and daily use of economy knowledge variables are not significant in Model 1 and Model 2, these variables are significant in Model 3. Hence advanced financial literacy increases the effect of age and daily use of economics.

Model 4 demonstrates that basic cryptocurrency literacy affects cryptocurrency ownership because $p < .001$ for basic cryptocurrency literacy index which is under the significance level and $B = 1.218$ which is positive. Similarly, analysis results of Model 5 exhibit that advanced cryptocurrency literacy has an influence on current cryptocurrency ownership as $p < .001$ and $B = 0.848$. Thus, both basic cryptocurrency literacy and advanced cryptocurrency literacy positively impact the decision of current cryptocurrency ownership.

Similar to Model 3, the age variable is significant in Model 5 as well with positive *B*-value. Therefore, it can be deducted that advanced cryptocurrency literacy increases the effect of age and people who less than 35 are much more active in owning cryptocurrencies currently.

5.4.4 Future cryptocurrency ownership intention

In addition to currently ownership of cryptocurrencies, another cryptocurrency participation method, ownership intention in the future, was also analyzed.

Table 49 shows future cryptocurrency ownership intention across gender, marital status, different age groups, education levels, income levels, financial literacy levels and cryptocurrency literacy levels. As reported in the table, cryptocurrency ownership intention is higher in all variables and variable levels compared to other cryptocurrency participation ways.

Table 49. Future cryptocurrency ownership intention across subgroups

Gender		**Marital Status**	
Female	39.3%	Not married	54.7%
Male	62.8%	Married	57.1%
Age interval		**Education degree**	
18 - 25 years	58.3%	High school	56.3%
25 - 35 years	51.9%	Associate degree	60.0%
35 - 45 years	67.3%	Undergraduate	53.9%
More than 45 years	52.4%	Graduate / doctorate	58.7%
Economics education		**Coding education**	
Not taken	54.5%	Not taken	52.0%
Taken	56.2%	Taken	61.5%
Personal income		**Household income**	
Less than 3000 TL	64.6%	Less than 3000 TL	75.0%
3000 TL - 5000 TL	53.1%	3000 TL - 5000 TL	68.3%
5000 TL - 10000 TL	50.0%	5000 TL - 10000 TL	45.0%
1.000 TL - 20000 TL	64.9%	1.000 TL - 20000 TL	57.6%
More than 20000 TL	66.7%	More than 20000 TL	58.1%
Financial literacy quartiles		**Cryptocurrency literacy quartiles**	
First quartile	49.6%	First quartile	31.7%
Second quartile	57.1%	Second quartile	53.8%
Third quartile	64.2%	Third quartile	74.6%
Fourth quartile	56.9%	Fourth quartile	78.6%

Cryptocurrency ownership intention is much more common among men with the rate of 62.8% compared to women with 39.3%. There is no so much difference between married and single respondents in terms of future ownership intention rates.

Cryptocurrency ownership intention rate is in highest in the age of between 35 and 45. Future ownership intention does not show a regular increase with education level. The highest ownership intention rate is for the respondents with associate degree with the rate of 60.0%

Cryptocurrency ownership intention firstly decreases from lowest personal income level to middle levels and then it starts increasing up to highest income level. Similar trend is shown in the household income levels as well.

Table 49 also demonstrate that from first financial literacy quartile to third financial literacy quartile future cryptocurrency ownership intention rates increase and in the fourth quartile the ratio decrease slightly. The rate of cryptocurrency ownership intention increases strongly as cryptocurrency literacy levels increase. As shown in the table below, while 31.7% of the respondents in the first cryptocurrency literacy quartile have an intention to own cryptocurrencies in the future, this ratio is 78.6% for the respondents in the fourth quartile.

In addition to crosstab analysis, cryptocurrency participation through future cryptocurrency ownership intention was analyzed via binary logistic regression analyses.

The logistic regression analyses in the research include 5 various model. Model 1 analyzes the effect of demographic variables in terms of cryptocurrency participation. While Model 2 analyzes demographic variables and basic financial literacy index together, Model 3 analyzes demographics and advanced financial literacy index. In the Model 4, demographics and basic cryptocurrency literacy index are analyzed. Lastly Model 5 analyzes demographics and advanced cryptocurrency literacy index in order to analyze the effect of these factors on future cryptocurrency ownership intention.

Table 50 gives observed and predicted cases for future cryptocurrency ownership intention. While Model 1 analyzing demographic variables classifies 62.9% correctly, Model 2 analyzing both demographic and basic financial literacy index classifies 63.6%

correctly the future cryptocurrency ownership intention. On the other hand, Model 3 including demographics and advanced financial literacy index classifies correctly future cryptocurrency ownership intention with 65.4%. Model 4 including demographics and basic cryptocurrency literacy index classifies 67.1% correctly. Lastly, Model 5 analyzing demographics and advanced cryptocurrency literacy index classifies future cryptocurrency ownership intention correctly with 65.7%.

Omnibus Tests of Model Coefficients part exhibits that the explanatory variables are significant for all models because *p*-value is under the reference value of 0.05 in all models.

The model summary part of the table gives R square values. According to Nagelkerke R Square values, Model 1 and Model 2 predicts 9% of the change in dependent variable by independent variables. This ratio is 12% in Model 3, 26% in Model 4 and 17% in Model 5.

Table 50. Classification table for future cryptocurrency ownership intention

In the future, do you think of buying, mining or minting cryptocurrencies?															
	Model 1			Model 2			Model 3			Model 4			Model 5		
Predicted / Observed	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct	No	Yes	Percent Correct
No	55	69	44.4	56	68	45.2	61	63	49.2	65	59	52.4	68	56	54.8
Yes	35	121	77.6	34	122	78.2	34	122	78.2	33	123	78.8	40	116	74.4
Overall Percentage			62.9			63.6			65.4			67.1			65.7
Omnibus Tests of Model Coefficients															
Chi-square	20.693			20.724			27.630			61.404			39.249		
df	10			11			11			11			11		
Sig. level	0.023			0.036			0.004			0.000			0.000		
Model Summary															
Cox & Snell R Square	0.071			0.071			0.094			0.197			0.131		
Nagelkerke R Square	0.095			0.096			0.126			0.264			0.175		

Table 51 shows the variable analyses in models in terms of future cryptocurrency ownership intention. In the Model 1 analyzing demographic variables, the only significant variable is gender as p = .001.

The base group is regarded as female in gender variable and in the analysis result for gender *B* = -0.913. Therefore, it can be concluded that men are much more eager to adopt cryptocurrencies in future. On the other hand, while passing from male to female, cryptocurrency purchase decision shows an adverse trend. The gender variable shows similar attitudes in all other models as well and gender is significant in these models.

Model 2 analyzes the effect of basic financial literacy together with demographics and analysis results show that there is no significant impact of basic financial literacy on future cryptocurrency ownership intention.

On the other hand, according to analysis results, when financial literacy level increase from basic to advanced, this has an impact on future cryptocurrency ownership intention as *p* = .010 which is under the significance level in Model 3 analyzing the effect of advanced financial literacy together with demographics.

Analysis results of Model 3 demonstrate that personal income variable is significant and *B*-value is positive. Hence, it can be concluded that advanced financial literacy increases the effect of personal income on future cryptocurrency ownership intention and people earning less than 5000 TL monthly are more wishful to adopt cryptocurrencies in the future. This variable also shows similar attitude in Model 4.

Table 51. Variable analysis for future cryptocurrency ownership intention

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Female	-0.913	0.001	-0.908	0.001	-0.888	0.002	-0.459	0.147	-0.803	0.006
Age (less than 35)	-0.481	0.121	-0.485	0.119	-0.438	0.166	-0.669	0.053	-0.316	0.330
Married	-0.003	0.991	-0.006	0.983	-0.064	0.820	0.146	0.630	-0.087	0.763
Education (Undergraduate)	-0.005	0.987	-0.002	0.994	0.016	0.957	0.073	0.813	-0.009	0.976
Personal income less than 5000 TL	0.448	0.150	0.454	0.147	0.681	0.039	0.768	0.024	0.263	0.417
Household income less than 10000 TL	-0.245	0.423	-0.249	0.416	-0.389	0.215	-0.232	0.474	-0.238	0.450
Economics / finance education	-0.041	0.894	-0.048	0.877	-0.319	0.334	-0.346	0.313	-0.044	0.888
Coding / programming education	0.293	0.282	0.288	0.292	0.345	0.212	-0.025	0.932	0.113	0.692
Daily use of economics (Little)	-0.243	0.372	-0.237	0.386	-0.240	0.384	-0.196	0.507	-0.157	0.577
Self-assessed literacy	0.060	0.610	0.060	0.610	0.025	0.835	0.028	0.825	0.020	0.868
Basic financial literacy index			0.017	0.861						
Advanced financial literacy index					0.318	0.010				
Basic cryptocurrency literacy index							0.877	0.000		
Advanced cryptocurrency literacy index									0.562	0.000
Constant	0.619	0.408	0.624	0.405	0.914	0.233	0.825	0.311	0.826	0.286

Model 4 demonstrates that basic cryptocurrency literacy affects future cryptocurrency ownership intention because p <.001 for basic cryptocurrency literacy index which is under the significance level and *B*-value is positive.

Similarly, analysis results of Model 5 exhibit that advanced cryptocurrency literacy has an influence on future cryptocurrency ownership intention as $p < .001$ and also $B = 0.562$. Thus, both basic cryptocurrency literacy and advanced cryptocurrency literacy positively impact future cryptocurrency ownership intention.

5.5 Discussions

Financial literacy and cryptocurrency literacy levels in addition to demographics of people were evaluated in terms of various ways of participation behavior to cryptocurrency market such as purchase, mining or minting, current ownership and future ownership intention.

Cryptocurrency participation crosstab analyses were performed across demographics, financial literacy quartiles and cryptocurrency literacy quartiles.

Analysis results indicate that there are significant differences between men and women in terms of especially purchase, current ownership and future ownership intention and men are much more active in the market. This result is consistent with the findings regarding more rapid technology adoption of males compared to females (Li, Glass, & Records, 2008)

Since cryptocurrencies as new and less regulated financial instruments, they can be regarded riskier compared to conventional financial instruments. Hence, women are

more prudent in cryptocurrency participation since women are more risk averse (Eckel & Grossman, 2008).

As a conventional financial instrument, stock ownership is much more common among males compared to females. The recent data of obtained from Borsa İstanbul indicates that 77% of the investors are male and only 23% of the investors are female. Therefore, it can be concluded that similar to stock market participation, males participate in cryptocurrency market much more compared to females.

Stock market participation among Borsa İstanbul stock investors in terms of different age intervals demonstrates that only 2% of the investors are between 18 and 25. This ratio is 13% for the age interval between 25 and 35. Stock market participation rates increase as the age increases such that 25% of the participants are between 35 and 45 and around 58% of the participants are more than 45.

On the other hand, cryptocurrency participation across different age intervals shows different pattern. While people with higher than 45 much more active in stock market participation, this age interval is the least active group in cryptocurrency participation. Different from stock ownership, people less than 25 participate cryptocurrency market much more.

Similar difference is shown for marital status in terms of cryptocurrency purchase and current ownership and compared to single people married ones are more active in purchase and current ownership. However, this difference is not seen in participating mining/minting activities and future ownership intention.

Crosstab analysis results also demonstrate that cryptocurrency participation rates for all participation methods increase in every upper quartile level from lowest quartile to highest quartiles.

In order to analyze whether or not there is a relation between financial literacy and cryptocurrency participation in detail, logistic regression analyses were also made for all participation ways.

Van Rooij et al. (2011) reported that basic financial literacy may not affect stock market participation decision and financially unsophisticated people may not invest in stock markets. Similarly, analysis results in this research indicate that there is no impact of basic financial literacy on cryptocurrency participation in none of the participation methods which are purchase, mining, current ownership and future ownership intention.

On the other hand, except from mining participation method, advanced financial literacy is significant in all remaining participation methods and when we consider the effect of advanced financial literacy, it can be deducted that there is a relationship between advanced financial literacy and cryptocurrency participation.

All these considered, it can be deducted that our hypothesis regarding financial literacy influence on cryptocurrency participation is supported because financial literacy level is a determinant and when financial literacy level increases from basic to advanced, people become more active in cryptocurrency participation.

The results of logistic regression tests analyzing the relationship between cryptocurrency literacy and cryptocurrency participation indicate that basic cryptocurrency literacy indexes are significant for all participation methods.

Similarly, advanced cryptocurrency literacy indexes are significant for all participation methods which are purchase, mining, current ownership and future ownership intention.

When these findings taken into consideration, it can be concluded that our hypothesis regarding cryptocurrency literacy impact on cryptocurrency participation is supported because there is a significant impact of cryptocurrency literacy on cryptocurrency participation and cryptocurrency literacy is determinant in cryptocurrency participation.

Cryptocurrency participation was also evaluated in terms of demographics of respondents and logistic regression analyses exhibit that none of the demographic variables are significant in all cryptocurrency participation methods. However, certain variables are significant in certain participation ways. As an illustration, gender variable is significant in purchase, ownership and future ownership intention.

Another significant variable is marital status in cryptocurrency purchase and current cryptocurrency ownership. Married respondents are more active ownership and purchase behavior compared to single respondents. However, the effect of marital status diminishes when advanced financial literacy and advanced cryptocurrency literacy were controlled.

Economics/finance education is another variable which is significant in certain participation methods. This variable is significant only in mining/minting participation method. However, economics/finance education diversely affects mining behavior.

All these findings considered, according to regression analyses results, none of the demographic variables are significant in all participation methods. On the other hand, except from mining/minting method, gender variable is significant in other participation ways. Regression analyses results display that men are more active in cryptocurrency participation. Hence, our hypothesis regarding the relationship between demographics and cryptocurrency participation is supported for only gender variables.

CHAPTER 6

CONCLUSION AND IMPLICATIONS

As a new type of financial instrument, although cryptocurrencies have taken attention of people and gain popularity in recent years, still they are not adopted widely. In this research, the relationship between cryptocurrency participation and financial literacy including cryptocurrency knowledge was studied.

A comprehensive literature review has been conducted and different aspects of cryptocurrencies were reviewed. In addition to distinguishing characters from conventional financial instruments, market capitalization and factors affecting cryptocurrency values were discussed. Furthermore, factors influencing the decision for adoption, technical aspects of cryptocurrencies including technology infrastructure, working mechanism, storage methods through wallets, consensus mechanism were reviewed comprehensively.

On the basis of literature review, a questionnaire was prepared in order to measure financial literacy and cryptocurrency literacy levels of people and evaluate the relation between literacy and cryptocurrency participation. The questionnaire was published online, distributed through social network platforms and shared via electronic mail with related parties including academicians and certain organizations in the market.

The data was gathered from 334 respondents and 330 of them were transferred to SPSS for analysis. In addition to descriptive analyses for demographic profiles, crosstab, regression and independent samples T-test analyses were performed by using SPSS 25.0.

Descriptive analyses point out that majority of respondents are male and most of the participants are between 25 and 35. Approximately 90% of the sample have at least university degree and around 40% of the respondents earn between 5000 TL and 10000 TL monthly.

Crosstab analyses in terms of financial literacy quartiles and cryptocurrency literacy quartiles across demographics indicate that there is no obvious difference in terms of financial knowledge level distribution between men and women. However, contrary to financial literacy, men are much more literate in terms of cryptocurrency compared to women.

Financial literacy of people varies according to education and as education level increases, financial literacy level also increases. On the other hand, there is no significant difference between various education degrees in terms of cryptocurrency literacy.

The higher monthly income, the higher financial literacy quartile, and this is valid for cryptocurrency literacy as well because there is a difference between monthly personal income levels in terms of cryptocurrency literacy.

There is significant difference between different age intervals in terms of financial literacy levels. On the other hand, cryptocurrency literacy levels do not show significant difference among different age intervals.

Cryptocurrency participation is considered in terms of different aspects which are historical purchase behavior, historical mining or minting behavior, current ownership and future ownership intention. These participation methods were analyzed

separately in terms of demographic profiles, financial literacy and cryptocurrency literacy.

Analysis evaluating cryptocurrency participation across demographics demonstrate that males are more active in the market while females are more prudent in cryptocurrency participation.

Marital status of people is also determinant in terms of cryptocurrency participation in certain types and married people are more active in purchase and current ownership.

Regression analyses indicate that basic financial literacy is not determinant in cryptocurrency participation. On the other hand, advanced financial literacy is significant in all participation behaviors except from participating mining/minting activities and when financial literacy level increases from basic to advanced, people become more active in cryptocurrency participation.

Regression analyses regarding cryptocurrency literacy and participation behavior exhibit that there is a relationship between cryptocurrency participation and both basic cryptocurrency literacy and advanced cryptocurrency are significant in all participation types.

While certain researches indicate that people with higher financial literacy scores use financial instruments much more (van Rooij et al., 2011), as new financial instruments, cryptocurrencies differ from other conventional financial instruments in terms of certain aspects. On the other hand, although it is difficult to determine total number of cryptocurrency participants, a recent research has projected that together with

35 million ID verified unique users, more than 139 million accounts have been created by 2018 (Rauchs et al., 2019).

The findings in this study give certain implications to cryptocurrency market players firstly in terms of raising awareness of cryptocurrencies. 15% of the questionnaire respondents are unaware of cryptocurrencies and this also affects directly participation rates. Hence, in order to increase participation rates, expanding awareness of people might be an important factor.

In addition, analyses results indicate that not financial knowledge but cryptocurrency knowledge levels of people have a direct impact on cryptocurrency participation, hence another implication for market players can be enabling opportunities for education and increasing cryptocurrency literacy of people.

There are certain limitations for this thesis study. Firstly, analyzed sample includes only 330 answers. A much broader sample might be more proper to reach more accurate and population reflecting findings. Secondly, demographic profile distribution of the sample is one of the limitations of the study. The sample is not homogenously distributed among different demographic profiles, such as male participants are majority and most of the respondents are between the age of 25 and 35. Education levels distribution is not homogenous as well and around 90% of the respondents have at least university degree.

In addition to making projection of the population with wider samples, new studies also can be conducted to gather information and analyze the subject with different aspects from market players' point of view.

APPENDIX A

QUESTIONNAIRE (ENGLISH)

1.	What are your most important sources of information and advice when you need to make important financial decisions? • Parents, friends or acquaintances • Newspapers • Financial magazines, guides, books • Bank brochures and customer representative • Advertisements on TV, in papers, or other media • Professional financial advisers • Financial computer programs • Financial information on the Internet • Other
2.	How would you assess your understanding of economics? (1 means very low and 7 means very high on a 7-point scale) • 1 (very low) • 2 • 3 • 4 • 5 • 6 • 7 (very high)
3.	To what extent do you need economic knowledge in your daily life and activities (work, hobby, etc.)? • A lot • Some • Little • Hardly ever
4.	Which of the following investment instruments do you use? • Term deposit account / participation account • Stocks • Bill / bond • Gold • Foreign currency • Personal retirement insurance • Real estate • Forex • Investment fund • Other …

5.	Which of the following is the property of money? • Medium of exchange • Unit of account • Store of value • All of the above • Do not know
6.	Suppose you have 100 TL in your bank account and the interest rate is 10% per year. How much is the money in your account after the interest payment is made after 1 year? (ignore tax) • More than 110 TL • 110 TL • Less than 110 TL • Do not know
7.	Suppose that the interest rate applied to the money in your bank account is 8% annually and the inflation rate is 10% annually. After 1 year, how much will be the purchasing power of the money in your account? (ignore tax) • More than today's purchasing power • Same as today's purchasing power • Less than today's purchasing power • Do not know
8.	In an environment where inflation is experienced, suppose that your friend inherited 10.000 TL today and his brother inherited 10.000 TL 3 years later. Who become richer due to inheritance? • Your Friend • Brother of your friend • Both are equally • Do not know
9.	Which of the following statements describes the main function of the stock market? • The stock market helps to predict stock earnings • The stock market results in an increase in the price of stocks • The stock market brings people who want to buy and sell stocks together • None of the above • Do not know
10.	Someone buying the stock of company A on the stock exchange market; • Owns a part of company A • Lends money to company A • Is responsible for debts of company A • None of the above • Do not know
11.	Someone who buys a bond issued by company A; • Owns a part of company A • Lends money to company A • Is responsible for debts of company A

	• None of the above • Do not know
12.	Under normal conditions, which of the following asset yields the highest fluctuation over time? • Savings accounts • Bonds • Stocks • Do not know
13.	If an investor distributes his/her money among different assets instead of investing in a single asset, risk of losing money • Increase • Decrease • Stay the same • Do not know
14.	If the interest rate falls, what happens to bond prices? • Increase • Decrease • Stay the same • Do not know
15.	Have you ever heard of Bitcoin, Ethereum, Ripple or any other similar cryptocurrency? • Yes • No
16.	Have you ever purchased any cryptocurrency? • Yes • No
17.	Have you ever done cryptocurrency mining or minting? • Yes • No
18.	Currently do you own any cryptocurrency? • Yes • No
19.	In the future, do you think of buying, mining or minting cryptocurrencies? • Yes • No
20.	Cryptocurrencies allow direct transactions between the two parties without the need for a trusted third party to be involved. • True • False • Do not know

21.	While the total supply of some cryptocurrencies is fixed, some others' total supply is changeable • True • False • Do not know
22.	Cryptocurrency transfer transactions take place instantaneously • True • False • Do not know
23.	Unlike fiat currencies, cryptocurrencies are independent of a central authority, and encryption methods are used to manage currency generation and fund transfers. • True • False • Do not know
24.	Cryptocurrency transactions are recorded in publicly available distributed ledgers • True • False • Do not know
25.	Bitcoin was issued and supported by a government • True • False • Do not know
26.	Increase in the interest of social media and the public …..... the value of cryptocurrencies; • Increases • Decreases • Does not affect • Do not know
27.	Cryptocurrencies …..... portfolio risk due to low correlation between national currencies traded in Forex markets and cryptocurrencies • Increases • Decreases • Does not affect • Do not know
28.	Cryptocurrencies working with Proof of Work (PoW) algorithm are more vulnerable to 51% attack risk. • True • False • Do not know

29.	In the Proof of Stake (PoS) consensus algorithm, the cryptocurrency miner's computational power is determinant in resolving cryptographic puzzles that confirm the accuracy of transactions • True • False • Do not know
30.	Cryptocurrency wallets are divided into two as hot and cold wallets depending on whether or not they work with internet connection • True • False • Do not know
31.	In the Proof of Stake (PoS) consensus algorithm, only users with that cryptocurrency can verify the accuracy of the transactions and participate in the new block creation process. • True • False • Do not know
32.	What are the main reasons for you to buy, mining or minting cryptocurrencies? (Answer if you bought cryptocurrency, participated in the mining or minting process) • Being interested in new technologies • Making investment • Earning income by trading • Using to purchase goods and services • Making payments without being identified • Making money order, EFT and other international payments • Using secure blockchain technology to prevent loss and fraud • Not trusting banks • Not trusting local currencies • Other …..
33.	What are the main reasons for not purchasing, mining or minting cryptocurrencies? (Answer if you have never had cryptocurrencies) • I don't understand the technology behind it • Not accepted as a means of payment everywhere • Current payment methods meet all my needs • The value of cryptocurrencies in terms of national currencies changes too much • Not guaranteed by any state or central bank • Not easy to buy or use • Costs in transition from traditional financial system to cryptocurrencies are high • Concerns about cyber theft • Concerns about being out of the surveilance of regulatory agencies

	• Other …..
34.	Gender: • Female • Male
35.	Age interval: • Less than 18 • 18 – 25 • 26 – 35 • 36 – 45 • More than 45
36.	Marital status: • Married • Not married
37.	Education degree: • Primary school • High school • Associate degree • Undergraduate • Graduate / Doctorate
38.	Have you taken any economics / finance courses during your education? • Yes • No
39.	Have you taken any coding / programming courses during your education? • Yes • No
40.	The sector you work in: • Justice and security • Information technologies • Education • Electric and electronic • Energy • Finance • Food • Construction • Culture, art and design • Media, communication and publishing • Automotive • Health and social services • Agriculture • Textile • Tourism and accommodation • Transport, logistic and communication

41.	Occupation: • …..
42.	Monthly personal income interval: • Less than 3000 TL • 3000 TL– 5000 TL • 5000 TL– 10000 TL • 10000 TL– 20000 TL • More than 20000 TL
43.	Monthly household income interval: • Less than 3000 TL • 3000 TL– 5000 TL • 5000 TL– 10000 TL • 10000 TL– 20000 TL • More than 20000 TL

APPENDIX B

QUESTIONNAIRE (TURKISH)

Finansal Okuryazarlık ve Kripto Para Piyasasına Katılım Anketi

Değerli Katılımcı,

Bu anket, Boğaziçi Üniversitesi Yönetim Bilişim Sistemleri Bölümü Yüksek Lisans Programı öğrencisi Emre Demirci'nin Prof. Dr. Ceylan Onay Şahin danışmanlığında yürüttüğü tez çalışmasında kullanılmak üzere hazırlanmıştır.

Araştırmanın amacı, finansal okuryazarlık düzeyi ile kripto para edinimi, kullanımı, madenciliği veya üretimi arasında bir ilişki olup olmadığını incelemektir. Anketi doldurarak değerli görüşlerinizi paylaşmanızı rica ederiz.

Anket sonuçları akademik araştırma amacıyla kullanılacak ve yanıtlar anonim olarak ele alınacaktır. Dolayısıyla ankette kimlik ve iletişim bilgileriniz talep edilmeyecek ve yanıtlarınız gizli tutulacaktır. Dilediğiniz takdirde, araştırmanın sonuçları hakkında bilgi almak, görüş ve sorularınızı iletmek için emre.demirci@boun.edu.tr adresiyle iletişim kurabilirsiniz.

Vakit ayırdığınız için teşekkür ederiz.
* Gerekli

Öz değerlendirme Soruları

1. Önemli finansal kararlar almanız gerektiğinde en önemli bilgi ve tavsiye kaynaklarınız nelerdir? *

Uygun olanların tümünü işaretleyin.

- [ ] Ebeveynler, arkadaşlar veya tanıdıklar
- [ ] Gazeteler
- [ ] Finansal dergiler, rehberler, kitaplar
- [ ] Banka broşürleri veya müşteri temsilcisi
- [ ] TV, gazete veya diğer ortamlardaki reklamlar
- [ ] Profesyonel finansal danışmanlar
- [ ] Finansal bilgisayar programları
- [ ] İnternette erişilen finansal bilgiler
- [ ] Diğer: _____

2. Ekonomiye ilişkin bilgi ve yetkinliğinizi nasıl değerlendirirsiniz? (7 ' lik ölçekte; 1 çok düşük, 7 çok yüksek anlamındadır) *

Yalnızca bir şıkkı işaretleyin.

- ( ) 1 (çok düşük)
- ( ) 2
- ( ) 3
- ( ) 4
- ( ) 5
- ( ) 6
- ( ) 7 (çok yüksek)

3. Günlük yaşantınızda ve aktivitelerinizde (iş, hobi vb.) ekonomi bilgisine ne ölçüde ihtiyaç duyuyorsunuz? *

Yalnızca bir şıkkı işaretleyin.

- ◯ Çok büyük ölçüde
- ◯ Önemli ölçüde
- ◯ Zaman zaman
- ◯ Neredeyse hiç

4. Aşağıdaki yatırım araçlarından hangilerini kullandınız / kullanmaktasınız? *

Uygun olanların tümünü işaretleyin.

- ☐ Vadeli mevduat / katılım hesabı
- ☐ Hisse senedi
- ☐ Tahvil / bono
- ☐ Altın
- ☐ Döviz
- ☐ Bireysel emeklilik algortası
- ☐ Gayrimenkul
- ☐ Forex
- ☐ Yatırım fonu

Diğer: ☐ _____

Finansal Okuryazarlık Soruları

5. Aşağıdakilerden hangisi paranın özelliğidir? *

Yalnızca bir şıkkı işaretleyin.

- ◯ Değişim aracı olma
- ◯ Hesap birimi olma
- ◯ Değer saklama aracı olma
- ◯ Hepsi
- ◯ Fikrim yok

6. Banka hesabınızda 100 TL'nizin olduğunu ve faiz oranının yıllık % 10 olduğunu varsayalım. 1 yıl sonra faiz ödemesi yapıldıktan sonra hesabınızdaki para ne kadar olur? (vergiyi dikkate almayınız) *

Yalnızca bir şıkkı işaretleyin.

- ◯ 110 TL'den fazla
- ◯ 110 TL
- ◯ 110 TL'den az
- ◯ Fikrim yok

7. Banka hesabınızdaki paraya uygulanan faiz oranının yıllık % 8 ve enflasyon oranının da yıllık % 10 olduğunu varsayalım. 1 yıl sonra, hesabınızdaki paranın satın alma gücü ne kadar olacaktır? (vergiyi dikkate almayınız) *

Yalnızca bir şıkkı işaretleyin.

- Bugünki alım gücünden daha fazla
- Bugünki alım gücü ile tam olarak aynı
- Bugünki alım gücünden daha az
- Fikrim yok

8. Enflasyonun yaşandığı bir ortamda, bir arkadaşınıza bugün 10.000 TL, kardeşine ise bundan 3 yıl sonra 10.000 TL miras kaldığını varsayalım. Miras nedeniyle kim daha zengin olmuştur? *

Yalnızca bir şıkkı işaretleyin.

- Arkadaşınız
- Arkadaşınızın kardeşi
- İkisi de eşit ölçüde
- Fikrim yok

9. Aşağıdaki ifadelerden hangisi menkul kıymet borsalarının ana işlevini açıklamaktadır? *

Yalnızca bir şıkkı işaretleyin.

- Hisse senedi kazançlarını tahmin etmeye yardımcı olur
- Hisse senedi fiyatlarının artmasına neden olur
- Hisse senedi alım satımı yapmak isteyenleri bir araya getirir
- Hiçbirisi
- Fikrim yok

10. Menkul kıymetler borsasında A şirketinin hissesini satın alan birisi: *

Yalnızca bir şıkkı işaretleyin.

- A şirketinin bir parçasının sahibi olur
- A şirketine ödünç para verir
- A şirketinin borçlarından sorumlu olur
- Hiçbirisi
- Fikrim yok

11. A şirketinin ihraç ettiği bir tahvili satın alan birisi: *

Yalnızca bir şıkkı işaretleyin.

- A şirketinin bir parçasının sahibi olur
- A şirketine ödünç para verir
- A şirketinin borçlarından sorumlu olur
- Hiçbirisi
- Fikrim yok

12. Normal şartlar altında aşağıdaki varlıklardan hangisinin getirisi zaman içerisinde en yüksek dalgalanmayı gösterir? *

Yalnızca bir şıkkı işaretleyin.

- Banka mevduat hesapları
- Tahviller
- Hisse senetleri
- Fikrim yok

13. Bir yatırımcı parasını tek bir varlığa yatırmak yerine farklı varlıklar arasında dağıtırsa para kaybetme riski *

Yalnızca bir şıkkı işaretleyin.

- Artar
- Azalır
- Aynı kalır
- Fikrim yok

14. Faiz oranlarının düşmesi halinde tahvil fiyatlarında nasıl bir etki görülür? *

Yalnızca bir şıkkı işaretleyin.

- Artar
- Azalır
- Aynı kalır
- Fikrim yok

Kripto Para Farkındalığı Sorusu

15. Daha önce hiç Bitcoin, Etherium, Ripple veya benzeri herhangi bir kripto paradan haberiniz oldu mu? *

Yalnızca bir şıkkı işaretleyin.

- Evet
- Hayır 34. soruya gidin

Kripto Para Okuryazarlığı Soruları

16. Daha önce hiç kripto para satın aldınız mı? *

Yalnızca bir şıkkı işaretleyin.

- Evet
- Hayır

17. Daha önce hiç kripto para madenciliği(mining) veya üretimi(minting) yaptınız mı? *

Yalnızca bir şıkkı işaretleyin.

- Evet
- Hayır

18. Halihazırda kripto paranız var mı? *

Yalnızca bir şıkkı işaretleyin.

- Evet
- Hayır

19. Gelecekte kripto para satın almayı, kripto para madenciliği(mining) veya üretimi(minting) yapmayı düşünüyor musunuz? *

Yalnızca bir şıkkı işaretleyin.

- Evet
- Hayır

20. Kripto paralar, güvenilir bir üçüncü tarafın dahil olmasına ihtiyaç duyulmadan, iki taraf arasında doğrudan işlem yapılmasına olanak sağlar. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

21. Bazı kripto paraların maksimum arz miktarları sabitken bazılarının ise değişkendir. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

22. Kripto para transfer işlemleri anında gerçekleşir. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

23. Kripto paralar, fiat para birimlerinin aksine, merkezi bir otoriteden bağımsızdır ve para oluşturma ile fon transferlerini yönetmek için şifreleme yöntemleri kullanır. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

24. Kripto para işlemleri halka açık olan dağıtılmış defterlere kaydedilir. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

25. Bitcoin bir devlet tarafından çıkarılmış ve desteklenmektedir. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

26. Sosyal medyanın ve kamuoyunun ilgisinin artması kripto paraların değerini: *

Yalnızca bir şıkkı işaretleyin.

- Azaltır
- Artırır
- Etkilemez
- Fikrim yok

27. Forex piyasalarında işlem gören ulusal paralar ile kripto paralar arasında korelasyonun düşük olması nedeniyle kripto paralar portföy riskini *

Yalnızca bir şıkkı işaretleyin.

- Azaltır
- Artırır
- Etkilemez
- Fikrim yok

28. Proof of Work (PoW) algoritması ile çalışan kripto paralar % 51 atak riskine daha açıktır. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

29. Proof of Stake (PoS) konsensus algoritmasında kripto para madenciliği yapan madencinin sahip olduğu işlemci gücü, işlemlerin doğruluğunu tasdik eden kriptografik bilmecelerin çözülmesinde belirleyicidir. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

30. Kripto para cüzdanları internete bağlı olarak çalışıp çalışmamalarına göre sıcak ve soğuk cüzdanlar olarak ikiye ayrılır. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

31. Proof of Stake (PoS) konsensus algoritmasında yalnızca o kripto paraya sahip olan kullanıcılar işlemlerin doğruluğunu tasdik ederek yeni blok oluşturma sürecine katılabilir. *

Yalnızca bir şıkkı işaretleyin.

- Doğru
- Yanlış
- Fikrim yok

32. Kripto paraları satın almanızın, madenciliğini veya üretimini yapmanızın başlıca nedenleri nelerdir? (Kripto para satın aldıysanız, madencilik veya üretim sürecine katıldıysanız cevaplayınız)

Uygun olanların tümünü işaretleyin.

- [ ] Yeni teknolojilerle ilgileniyor olmak
- [ ] Yatırım yapmak
- [ ] Alım satım yaparak gelir elde etmek
- [ ] Mal ve hizmet satın almak için kullanmak
- [ ] Kimliğim belli olmadan ödeme yapmak
- [ ] Havale, EFT veya diğer uluslararası ödemeleri yapmak
- [ ] Kayıp ve sahtekarlığı önlemek için güvenli blok zinciri teknolojisi kullanmak
- [ ] Bankalara güvenmiyor olmak
- [ ] Yerel paralara güvenmiyor olmak

Diğer: [ ] _____

33. Kripto paraları satın almamış, madenciliğini veya üretimini yapmamış olmanızın başlıca nedenleri nelerdir? (Kripto paralara hiç sahip olmadıysanız cevaplayınız)

Uygun olanların tümünü işaretleyin.

- [ ] Arkasındaki teknolojiyi anlamıyorum
- [ ] Her yerde ödeme aracı kabul edilmiyor
- [ ] Mevcut ödeme yöntemleri tüm ihtiyaçlarımı karşılıyor
- [ ] Kripto paraların ulusal para birimleri cinsinden değeri çok fazla değişiyor
- [ ] Herhangi bir devlet veya merkez bankası tarafından garanti edilmiyor
- [ ] Satın alınması veya kullanımı kolay değil
- [ ] Geleneksel finansal sistemden kripto paralara geçişteki maliyetler yüksek
- [ ] Siber hırsızlık konusunda endişeye sevkediyor
- [ ] Düzenleyici kurumların gözetimi dışında olması endişeye sevkediyor

Diğer: [ ] _____

Demografi Soruları

34. Cinsiyetiniz *

Yalnızca bir şıkkı işaretleyin.

- ( ) Kadın
- ( ) Erkek

35. Yaş aralığınız *

Yalnızca bir şıkkı işaretleyin.

- ( ) 18 yaş altı
- ( ) 18 – 25
- ( ) 25 – 35
- ( ) 35 – 45
- ( ) 45 yaş üstü

36. Medeni haliniz: *

Yalnızca bir şıkkı işaretleyin.

- Evli
- Evli değil

37. Eğitim seviyeniz: *

Yalnızca bir şıkkı işaretleyin.

- İlköğretim
- Lise
- Ön Lisans
- Lisans
- Yüksek Lisans/Doktora

38. Eğitiminiz boyunca hiç ekonomi / finans dersi aldınız mı? *

Yalnızca bir şıkkı işaretleyin.

- Evet
- Hayır

39. Eğitiminiz boyunca hiç kodlama / programlama dersi aldınız mı? *

Yalnızca bir şıkkı işaretleyin.

- Evet
- Hayır

40. Çalıştığınız sektör *

Yalnızca bir şıkkı işaretleyin.

- Adalet ve Güvenlik
- Bilişim Teknolojileri
- Eğitim
- Elektrik ve Elektronik
- Enerji
- Finans
- Gıda
- İnşaat
- Kültür, Sanat ve Tasarım
- Medya, İletişim ve Yayıncılık
- Otomotiv
- Sağlık ve Sosyal Hizmetler
- Tarım
- Tekstil
- Turizm, Konaklama
- Ulaştırma, Lojistik, Haberleşme
- Diğer

41. Mesleğiniz: *

_____

42. Aylık kişisel gelir aralığınız: *

Yalnızca bir şıkkı işaretleyin.

- 3.000 TL'den az
- 3.000 TL – 5.000 TL
- 5.000 TL – 10.000 TL
- 10.000 TL – 20.000 TL
- 20.000 TL'den fazla

43. Aylık hanehalkı gelir aralığınız: *

Yalnızca bir şıkkı işaretleyin.

- 3.000 TL'den az
- 3.000 TL – 5.000 TL
- 5.000 TL – 10.000 TL
- 10.000 TL – 20.000 TL
- 20.000 TL'den fazla

APPENDIX C

CORRELATION TABLE OF VARIABLES

		Gender	Age	Marital Status	Education degree	Personal income	House income	Economics education	Coding education	Daily use of economics	Self-financial literacy assessment	BFL Index	AFL Index	BCL Index	ACL Index
Gender	Pearson Correlation	1	-0.036	-0.043	0.093	0.086	0.030	-0.086	-.171**	.125*	-.233**	-.153*	-.127*	-.347**	-.171**
	Sig. (2-tailed)		0.549	0.478	0.121	0.152	0.619	0.153	0.004	0.037	0.000	0.010	0.034	0.000	0.004
Age	Pearson Correlation	-0.036	1	-.254**	.158**	.135*	.154**	-0.042	0.106	0.082	-0.087	0.057	-.125*	0.044	-.136*
	Sig. (2-tailed)	0.549		0.000	0.008	0.024	0.010	0.489	0.077	0.169	0.149	0.344	0.037	0.465	0.023
Marital Status	Pearson Correlation	-0.043	-.254**	1	-.122*	-.156**	-.243**	-0.037	-.197**	-0.065	0.099	0.022	0.107	-0.068	0.070
	Sig. (2-tailed)	0.478	0.000		0.042	0.009	0.000	0.540	0.001	0.278	0.099	0.713	0.075	0.253	0.242
Education degree	Pearson Correlation	0.093	.158**	-.122*	1	.230**	.269**	-.175**	-.143*	0.061	-.121*	-0.105	-.120*	-.130*	-0.046
	Sig. (2-tailed)	0.121	0.008	0.042		0.000	0.000	0.003	0.016	0.310	0.044	0.079	0.046	0.029	0.446
Personal income	Pearson Correlation	0.086	.135*	-.156**	.230**	1	.502**	-.281**	0.006	0.000	-.207**	-.142*	-.333**	-.196**	0.112
	Sig. (2-tailed)	0.152	0.024	0.009	0.000		0.000	0.000	0.921	1.000	0.000	0.017	0.000	0.001	0.062
Household income	Pearson Correlation	0.030	.154**	-.243**	.269**	.502**	1	-.174**	-0.061	0.036	-.139*	-0.024	-0.067	-.118*	0.011
	Sig. (2-tailed)	0.619	0.010	0.000	0.000	0.000		0.003	0.311	0.549	0.020	0.693	0.266	0.049	0.857
Economics education	Pearson Correlation	-0.086	-0.042	-0.037	-.175**	-.281**	-.174**	1	0.016	-.152*	.310**	.185**	.400**	.215**	0.020
	Sig. (2-tailed)	0.153	0.489	0.540	0.003	0.000	0.003		0.790	0.011	0.000	0.002	0.000	0.000	0.739
Coding education	Pearson Correlation	-.171**	0.106	-.197**	-.143*	0.006	-0.061	0.016	1	0.037	-0.001	0.112	-0.069	.245**	.174**

		Gender	Age	Marital Status	Education degree	Personal income	House income	Economics education	Coding education	Daily use of economics	Self-financial literacy assessment	BFL Index	AFL Index	BCL Index	ACL Index
	Sig. (2-tailed)	0.004	0.077	0.001	0.016	0.921	0.311	0.790		0.542	0.991	0.062	0.253	0.000	0.003
Daily use of economics	Pearson Correlation	.125*	0.082	-0.065	0.061	0.000	0.036	-.152*	0.037	1	-.386**	-.133*	-0.115	-0.081	-.162**
	Sig. (2-tailed)	0.037	0.169	0.278	0.310	1.000	0.549	0.011	0.542		0.000	0.026	0.055	0.176	0.007
Self-financial literacy assesment	Pearson Correlation	-.233**	-0.087	0.099	-.121*	-.207**	-.139*	.310**	-0.001	-.386**	1	.119*	.272**	.181**	.153*
	Sig. (2-tailed)	0.000	0.149	0.099	0.044	0.000	0.020	0.000	0.991	0.000		0.047	0.000	0.002	0.011
BFL Index	Pearson Correlation	-.153*	0.057	0.022	-0.105	-.142*	-0.024	.185**	0.112	-.133*	.119*	1	.307**	.256**	0.100
	Sig. (2-tailed)	0.010	0.344	0.713	0.079	0.017	0.693	0.002	0.062	0.026	0.047		0.000	0.000	0.096
AFL Index	Pearson Correlation	-.127*	-.125*	0.107	-.120*	-.333**	-0.067	.400**	-0.069	-0.115	.272**	.307**	1	.412**	0.082
	Sig. (2-tailed)	0.034	0.037	0.075	0.046	0.000	0.266	0.000	0.253	0.055	0.000	0.000		0.000	0.169
BCL Index	Pearson Correlation	-.347**	0.044	-0.068	-.130*	-.196**	-.118*	.215**	.245**	-0.081	.181**	.256**	.412**	1	.357**
	Sig. (2-tailed)	0.000	0.465	0.253	0.029	0.001	0.049	0.000	0.000	0.176	0.002	0.000	0.000		0.000
ACL Index	Pearson Correlation	-.171**	-.136*	0.070	-0.046	0.112	0.011	0.020	.174**	-.162**	.153*	0.100	0.082	.357**	1
	Sig. (2-tailed)	0.004	0.023	0.242	0.446	0.062	0.857	0.739	0.003	0.007	0.011	0.096	0.169	0.000	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

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