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## DETERMINANTS OF CRYPTOCURRENCY INVESTMENT

### KRIPTOPARA YATIRIM KARARLARININ BELİRLEYİCİLERİ

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## **PREFACE**

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## **LIST OF ABBREVIATIONS**

BTC	: Bitcoin
CFA	: Confirmatory Factor Analysis
EP	: European Parliament
EU	: European Union
WB	: World Bank



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## ABSTRACT

In this research, it was aimed to evaluate effects of behavioral bias on crypto currency investment decisions. The universe of the study includes banking sector workers in Istanbul in 2021, and sample of the study includes 443 banking sector workers with voluntary participation method. Financial Literacy Scale developed by Kayacan (2019) was used. For digital literacy evaluation, Digital Literacy Scale developed by Üstündağ et al (2017) was used. According to results of the study, there were statistically significant differences between demographic properties of crypto-currency investors and non-investors ( $p<0.05$ ). There were statistically significant differences between confidence levels of crypto-currency investors and non-investors ( $p<0.05$ ). There were statistically significant differences between risk levels of crypto-currency investors and non-investors ( $p<0.05$ ). There were not statistically significant financial literacy score differences between crypto-currency investors and non-investors ( $p>0.05$ ). There were statistically significant digital literacy score differences between crypto-currency investors and non-investors ( $p<0.05$ ). Financial literacy levels had insignificant effect on crypto currency investing decision ( $p>0.05$ ), whereas digital literacy levels have significant effect on crypto currency investing decision ( $p<0.05$ ). According to correlation coefficient, the most related factor affecting crypto currency was risk, followed by confidence gender and digital literacy.

**Keywords:** Cryptocurrency, Financial Behavior, Over confidence, Risk, Digital literacy, Financial literacy

## ÖZET

Bu araştırmada davranışsal yanlılığın kripto para yatırım kararları üzerindeki etkilerinin değerlendirilmesi amaçlanmıştır. Araştırmancın evrenini 2021 yılında İstanbul'da bulunan bankacılık sektörü çalışanları, örneklemi ise gönüllü katılım yöntemiyle 443 bankacılık sektörü çalışanı oluşturmaktadır. Kayacan (2019) tarafından geliştirilen Finansal Okuryazarlık Ölçeği kullanılmıştır. Dijital okuryazarlık değerlendirmesi için Üstündağ ve diğerleri (2017) tarafından geliştirilen Dijital Okuryazarlık Ölçeği kullanılmıştır. Araştırmancın sonuçlarına göre, kripto para yatırımcıları ile yatırımcı olmayanların demografik özellikleri arasında istatistiksel olarak anlamlı farklılıklar vardı ( $p<0.05$ ). Kripto para yatırımcıları ile yatırımcı olmayanların güven seviyeleri arasında istatistiksel olarak anlamlı farklılıklar vardı ( $p<0.05$ ). Kripto para yatırımcıları ile yatırımcı olmayanların risk seviyeleri arasında istatistiksel olarak anlamlı farklılıklar vardı ( $p<0.05$ ). Kripto para yatırımcıları ile yatırımcı olmayanlar arasında istatistiksel olarak anlamlı finansal okuryazarlık puanı farkı bulunmadı ( $p>0.05$ ). Kripto para yatırımcıları ve yatırımcı olmayanlar arasında istatistiksel olarak anlamlı dijital okuryazarlık puan farklılıkları vardı ( $p>0.05$ ). Finansal okuryazarlık düzeylerinin kripto para yatırım kararı üzerinde etkisi önemsiz ( $p>0.05$ ), dijital okuryazarlık düzeylerinin ise kripto para yatırım kararı üzerinde anlamlı bir etkisi var ( $p<0.05$ ). Korelasyon katsayısına göre kripto para birimini en çok etkileyen faktör risk olurken, bunu güven cinsiyeti ve dijital okuryazarlık izlemiştir.

**Anahtar Kelimeler:** Kriptopara, Finansal Davranış, Aşırı güven, Risk, Dijital okuryazarlık, Finansal okuryazarlık

## CHAPTER 1

### 1. INTRODUCTION

Technologic developments and digital opportunities have brought the virtualization of money, recently. In the late 1980s the development of digital currency first reported in the Netherlands. The smart card system was started to use to prevent theft for gas station owners and truck drivers, money was loaded onto smart cards and this money was used for fuel. With this development, POS devices became common in Europe for customers to make direct payments from their bank accounts as Geldkarte (Germany), Proton (Belgium), Moneo (France), Chipnick (Netherlands), Mondex (England), Suica (Japan), Octopus (Hong Kong), and EZ-link (Singapore). The first e-money applications were launched in Europe and Asia in the 1990s as card-based products in the form of electronic wallets. The transition from gold to gold-based paper money and then to digital money has become more common (BTK, 2020).

In recent years, the use and importance of bitcoin and similar crypto currencies has gradually increased. In this environment, the impact of this investment tool, which is increasingly used by monetarists, on national economies has not been adequately studied. AS an alternative investment device, crypto currencies and block chain may affect economic indicators and recession.

In the 2018 European Union tax report, it was stated that the volume of block chain has reached a market value of more than 7 billion dollars worldwide, that it is above the GNP value of many countries, and it is necessary to examine its economic effects in detail. Chiu et al (2018) examined the crypto currency economy over bitcoin. In the study, it was reported that Bitcoin causes a loss of welfare by 1.4%, which is due to delayed investments due to mining and virtual money. Mikhaynov (2020) examined the crypto money market in terms of open innovation and reported that crypto currencies with less complex structure are more effective. Yılmaz and Hazar (2018) reported in their study that investors' interest in cryptocurrencies is high. Seetharaman et al. (2017) reported that there is a significant relationship between Bitcoin and USD, and they reported that the effect of the Bitcoin index on the economy may be similar to the USD. Pisa and Juden (2017) revealed the role of

blockchain in economic development, while Abadi and Brunnermeier (2018) examined the blockchain economy and reported that it is seen as an economic value. Beck et al (2019) reported that the economic impact of blockchain on Danish industry and labor market is significant.

All these studies show that crypto currencies will gain even more importance in the near future. The fact that the relationship between crypto currencies and the USD, which is one of the valid currencies in the world, has been empirically revealed and that it has a market exceeding 7 billion dollars, which should be taken into account in the EU reports, points out the effect of crypto currencies on the economy.

In this research, it was aimed to evaluate effects of behavioral bias on crypto currency investment decisions.

## CHAPTER 2

### 2. LITERATURE REVIEW

In order to understand effect of behavioral bias on crypto currency investment decisions, crypto currency and financial behavior concepts. In this chapter, a brief information on these concepts were given.

#### 2.1. Crypto Currency

The money, also called digital, encrypted or virtual money, is produced, bought, sold and used as a means of exchange in the computer environment. Cryptocurrencies are the money that can be put on the market and used without the need for the support of any central bank, government or any official institution behind it. Cryptocurrencies are one of the innovations that the 21st century has brought to human life. The first used cryptocurrency was Bitcoin. The use of this money requires the existence of blockchain technology. The basis of the rapid spread of the crypto money called Bitcoin in the world is the blockchain technology. Satoshi Nakamoto is the creative father of the technology that allows this crypto money to become widespread and use money safely. This name is not actually a person's name, but a nickname. Nakamoto developed a theory on multiple spending in his 2008 article. The concept of Bitcoin, which is the first crypto money, entered human life may be named "Peer-to-peer electronic cash payment system" (Köylü, 2018). Thus, crypto currency may also be described as a kind of payment system.

Payment systems and its instruments continue to evolve and diversify to give answer to new customer needs in emerging economic areas. Globalization process and the high-tech applications that are shaping the modern world create the needs that are characteristic of today in the field of payments and the world of finance; Sometimes infrastructure deficiencies and sometimes legal frameworks create a barrier to meeting these needs. The concept of virtual currency, which appeared in these conditions, can be considered as a type of asset, formed by new demands of consumers, which are hardly satisfied with traditionally used payment instruments and financial services. The emergence and definition of the virtual currency is a phenomenon. The concept of financial technology is used to describe various

innovative business models and technologies that can transform the financial services industry (Çetinkaya, 2018). It may be argued that the most important development of financial digital technologies is digital money.

Digital money has been commonly used, and this has also become a priority for institutions and countries. The President of the European Central Bank (ECB), Christine Lagarde, in her first speech as President, stated that the bank has plans to direct the special task organs to digital or crypto currencies. Lagarde stated that “with the developments in the digital money market, the European Central Bank should play a leading role in the use of new technologies that can prevent traditional banking systems and procedures” (BTK, 2020).

In short, it may be concluded that crypto currency is an important development of financial digital technologies, and its main role in digital finance sector is a payment and monetary system.

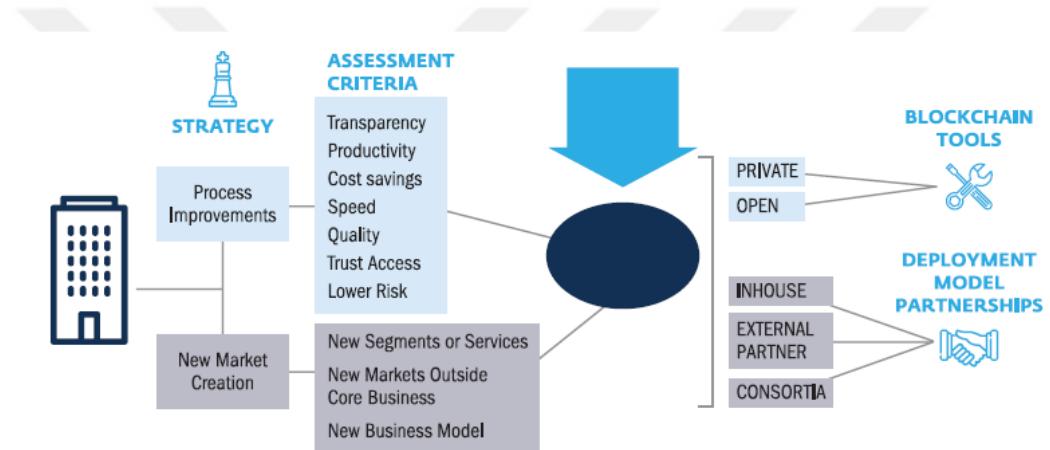
### **2.1.1. Definition of Crypto Currency**

Crypto currency is a term derived from the words "crypto currency", "crypto" and "currency". Cryptocurrency is a virtual or digital currency that relies on cryptography, the science of cryptography, to provide security. Cryptocurrencies are produced in decentralized cryptosystems at fixed rates / numbers. By another definition, cryptocurrency is like the coins and banknotes that individuals have already used and the difference is; are digital assets that were developed using certain cryptography principles (BTK, 2020). The increase in use of internet technologies on digital finance may be the most important reason for development of crypto currency.

As the internet becomes widespread and the number of users increases, transactions are diversified and transaction volume increases. Accordingly, in addition to electronic or digital money, various currencies such as virtual money and crypto money have also emerged on the internet. As a matter of fact, according to a report prepared by Dabrowski and Janokowski for the EU Economic and Monetary Policy Unit, there are more than 1,500 digital currencies in the market as of 2018, and among these currencies, Bitcoin, Etherium and Ripple are in the top three in

terms of market value and transaction volume. However, the emergence of different types of money under various names other than physical money in the market also causes a conceptual confusion. In this context, digital or electronic money's extensions of normal money in digital or electronic environment; Although digital currencies are not affiliated with any official institution, they are traded like money among a certain community; It can be said that cryptocurrencies are encrypted digital currencies with digital money characteristics (Çizmeci ve Göver, 2020). Blockchain Strategy Assessment Matrix was given in the Scheme 2.1.

**Scheme 2. 1. Blockchain Strategy Assessment Matrix**



**Source:** IFS, 2019.

### 2.1.2. Types of Crypto Currency

Cryptocurrency types are mainly related with blockchain technology, and it may be defined as an open register of data collected on the internet. The system is essentially based on connection of encrypted data with chain rings and the system combines them into unchangeable blocks (BTK, 2020). These different structures have also different types of digital money or currencies.

The names of some of the more than 1600 cryptocurrencies traded in the world markets are quite unusual. Some of them are as follows: These

cryptocurrencies such as Cabbage, Garlicoin, PotCoin are cryptocurrencies that are traded in the market in order to attract the attention of those who love the said plant and/or to use these cryptocurrencies in their commercial relations with each other. Another type of naming is to give a country or city name. As an example of these; India Coin, Dutch Coin, TOKYO, FinCoin and AmsterdamCoin can be given. AvatarCoin and FuzzBalls are examples for cryptocurrencies inspired by graphic designs(Köylü, 2018).

There were cryptocurrencies named after the currencies supported by central banks or governments. Examples of these are; Eurocoin, Money, Shekel, Dollarcoin. Coins that take their name from civilizations in history and can be given as examples of these cryptocurrencies are Huncoin and IncaKoin. Some cryptocurrencies are also based on pets, such as Cat Coins and Dogcoin. In addition to all these, there are cryptocurrencies prepared to pay homage to some heads of state or for popular personalities. These; Helleniccoin is PutinCoin, TrumpCoin, Theresa May Coin. Currencies attributed to sporting activity or hobbies; Golfcoin is ChessCoin, Ride My Car, MustangCoin, SongCoin or Runners. There are also money names that refer to occupational groups. The most striking of these is Denta Coin. In addition to currencies such as CoffeeCoin, Sugar Exchange, Honey that evokes the food and beverage loved by humanity, bad money names such as Evil Coin were also used. Mooncoin, on the other hand, is a crypto currency in which the total money supply is limited, taking into account the average distance from the earth to the moon. Mooncoin uses the blockchain network and also uses its own programming language called MoonWord to keep records on the blockchain (Köylü, 2018). In short, there are many crypto currencies, and their types are increasing continuously.

Bitcoin is described as a set of concepts and topics that make up digital money financing and economics. The system includes open source software that runs on a wide variety of devices. Its structure is completely digital and does not require a physical representation of the structure. Bitcoin is divisible by up to 8 digits, and this enables transactions with 0.00000001 bitcoin. Satoshi is the smallest unit and 100 million satoshi are equal to 1 BTC. Although the theories on which Bitcoin is based are quite technical, it is very easy to use. By installing one of the wallet programs, you can start buying, selling, and transferring Bitcoin right away (Çetinkaya, 2018).

Basic crypto currency types and properties were given in the table below.

**Table 2. 1. Basic crypto currency types and properties**

	Name	Price	Market Cap	Volume(24h)
1	Bitcoin BTC <a href="#">Buy</a>	\$43,171.83	\$815,967,376,973	\$32,941,606,476 783,899 BTC
2	Ethereum ETH <a href="#">Buy</a>	\$3,433.31	\$408,303,016,774	\$26,310,233,714 2,013,222 ETH
3	Binance Coin BNB <a href="#">Buy</a>	\$475.13	\$79,262,207,286	\$4,746,619,377 9,888,371 BNB
4	Tether USDT <a href="#">Buy</a>	\$1.00	\$78,557,072,088	\$79,231,735,835 78,216,838,287 USDT
5	Solana SOL <a href="#">Buy</a>	\$150.99	\$46,748,019,469	\$2,380,419,657 11,715,861 SOL
6	USD Coin USDC	\$1.00	\$43,085,142,148	\$5,154,861,155 5,150,078,477 USDC
7	Cardano ADA	\$1.27	\$42,564,964,444	\$1,866,529,358 1,311,514,910 ADA
8	XRP XRP	\$0.7838	\$37,243,634,219	\$2,688,349,881 1,408,706,301 XRP
9	Terra LUNA <a href="#">Buy</a>	\$79.19	\$28,427,326,979	\$2,419,531,948 30,544,498 LUNA
10	Polkadot DOT	\$26.79	\$26,429,308,435	\$1,587,664,200 60,325,969 DOT

**Source:** <https://coinmarketcap.com/>, 2022.

The Bitcoin system is classified into six subsystems. These classifications are as follows (Dayanan, 2021; Gültekin & Bulut, 2017):

**Mining Firms:** These firms provide computational power for the mathematical operations needed to verify the reliability of the transactions, thanks to their collective workforce. Thus, they act as a mint by allowing new Bitcoins to be produced.

**Firms Providing E-Wallet Service:** It is an application that allows the person to store the personal keys needed to transact with Bitcoins belonging to him. Wallets can be in paper, desktop, online, hardware and mobile format.

**Financial Service Providers:** Services such as Forex transactions, stock trading, financial asset trading, futures exchanges, option trading, contract trading are also provided in Bitcoin. They are companies that pay interest in exchange for Bitcoin invested in them. **Money Markets:** Markets that have the task of providing the

exchange of only Bitcoin or all crypto currencies with all other currencies in the classical sense.

**Payment Processors:** These companies are the companies that allow the parties who want to trade via crypto currencies to make and receive payments.

**Multi-Purpose Firms:** A multi-purpose firm serves both as an e-wallet service and as a payment processor.

**Scheme 2. 2. Types and development of crypto currency**



**Source:** European Parliament, 2018.

**Scheme 2. 3. Financial value of BTC for last five years**



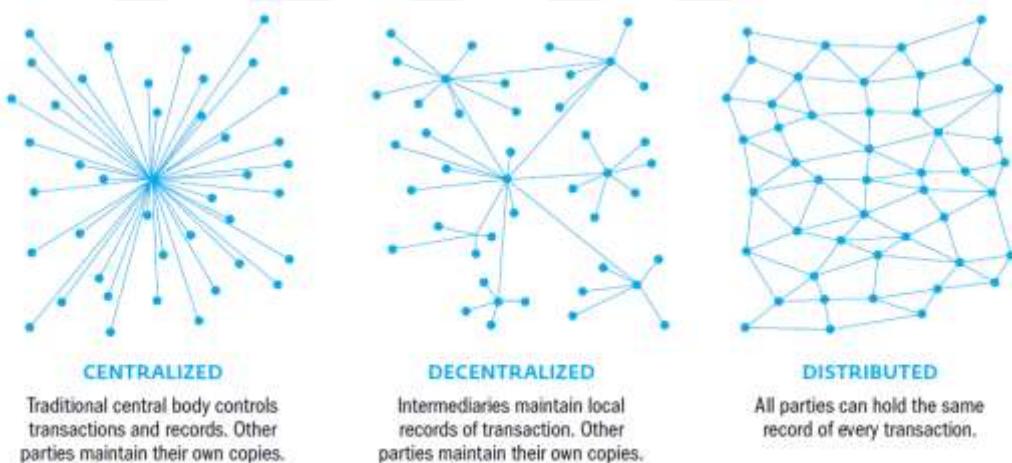
**Source:** Google Finance, 2022.

### 2.1.3. Financial Values of Crypto Currency

Cryptocurrencies have different properties than normal money. While currencies are centralized in the banking system, cryptocurrencies are generally decentralized. While governments in the traditional monetary system are empowered to print additional money through the national central banks if necessary, they cannot produce cryptocurrencies or confiscate cryptocurrencies without the consent of the person. The amount and time of the cryptocurrencies created by the blockchain system are determined during crypto system was established (BTK, 2020).

Evolution of Ledger types were given in the scheme below.

**Scheme 2. 4. Evolution of Ledgers**



Source: IFC, 2019.

In the digital age, money started to be represented as a unit in bank accounts, and it continues to appear in different forms and systems with developing technologies. In the blockchain system, where cryptocurrencies are traded and transactions are carried out directly between two users over a network without the need for an intermediary, the transactions are encrypted and shared with other users on the network. Blockchain is a distributed ledger technology open to all users, in which the shared transaction information is verified and approved by other users according to the network protocol, and the transaction record is created by adding it

to the other block that precedes it. In this technology, a database is created by recording the data sequentially in blocks without a central system. Blockchain system, which has many different uses in almost every sector today, person-to-person borrowing, distributed credit systems, supply chain, electronic voting systems, notary public, letter of credit transactions, creation-transfer-storage of valuable documents, e-commerce and payments, securities brokerage. and storage services, all kinds of data recording, data transfer and data storage can be integrated into activities that require data storage (Mete et al, 2019). Besides these opportunities, technologic opportunities have increased large scaled technological finance projects.

Technological finance projects are representing in types such as data services, payments, blockchain, planning, insurance, financing, investment, and security. Strong financial institutions such as IT companies, big banks, and infrastructure service providers has important role in the financial ecosystem. Financial technology, which emerged from the encounter of financial services with technology, has a dynamic structure. If you look at the characters in this area, it becomes clear that over time they can all reincarnate into one another. Financial organizations have received a more technological structure. Large tech companies may offer peer-to-peer payment services through social media and email. The number of fintech companies is increasing every year, with retail payments being the most active (Çetinkaya, 2018). Blockchain value chain was shown in the Scheme 2.5.

**Scheme 2. 5. Blockchain value chain**



**Source:** IFC, 2019.

The use of cryptocurrencies common for exchange of art works. For artists working with intermediaries to reach new customers are already using the many conveniences provided by the internet. At the point reached today, many digital art platforms and networks have been created where crypto money is accepted as a payment tool. Reinier Van Den Bezermer Schoonderwoerd, who lives in Amsterdam and sells his piece “Collaboration for 10,000 Euros using cryptocurrencies is one of the artists benefiting from this platform” (BTK, 2020). In short, it may be argued that digital finance is relying on crypto currency, and thus, crypto currency has digital value for finance.

## **2.2. Determinants of an Investment**

Determinants of an investment decision vary depending on investors and investment types. Gender is one of the main variables that come to the fore in many investment decision studies, as a patriarchal social structure is dominant in the historical process. In addition, many factors such as income, economic level, education, literacy level affect the investment decision.

The general assumption in business, economics, and academia is that people exhibit rational choice behavior because they are rational individuals. The origin of rational choice behavior goes back to the work done by Adam Smith (1776) in the 18th century. In this study, Smith assumes that people carry out their decision-making processes with complete and perfect information and that they can process this information accurately and without bias. This Smith theory forms the basis of courses, economic models, and politics taught at prestigious universities around the world. The theory is also often criticized for its inadequacy, assumptions incompatible with the real world, and portrayal of people (Tekin, 2016). At this point, financial decision process and factors affecting to this process becomes important.

Financial decisions include cash, credit and savings behaviors. Informed, financially educated consumers can make better decisions for themselves and their families and therefore increase their economic security and well-being. An effective and efficient market is essential for informed consumers who make informed

choices. Studies have stated that individual financial management can be an important factor in the financial well-being of individuals, and therefore they have addressed the behavioral dimensions of personal financial management. Accordingly, financial management, financial planning for long and short-term financial goals; financial management of income and credit; It includes the dimensions of financial behavior and future investment through the purchase of housing, insurance, automobiles and other consumer goods, and various services, including banking, insurance and investment (Erişen ve Yılmaz, 2021). It may be argued that all these factors are important determinants of financial decision stages.

Behavioral finance, what shapes investor behavior, what are the factors behind individual investor thoughts, what kind of information is taken into account when making investment decisions, how much basic information about the stock is taken into account and how accurately it interprets, what other factors besides the financial factors of a company in the investor's decision. As effective as it is, it seeks answers to similar questions. Research conducted on investors has determined that although investors want to rationally maximize their preferences, diversify their portfolios and avoid risk in their investment decisions, they cannot do this in real-life investments. Cognitive defects are shown as the main reason for this (Tufan ve Sarıçık, 2013). On the other hand, investing and decision model mentions cognitive and over reactive behaviors.

In the representative investing and decision model, underreaction is described as a type of overreaction and conservatism which are explained by representativeness bias. In the model, although the corporate profits, which the investors take as a variable with the tendency of the company profits, which surprise the investors in the same direction, to return to the average at first. They believe that it will show, and that after a while, it enters the trend. This perception of change in the minds of investors is modeled as a Markow process. In this model, underreaction occurs when investors believe that when profits change in one direction, they will return to the average. An overreaction occurs when traders believe a trend has started after several surprises in the same direction in a row (Barak, 2008). Another important factor for investing and decision is uncertainty which is related with decision theory.

Decision theory under uncertainty, especially investment decisions, portfolio preferences, fund preferences, investment in securities, etc. They are based on the assumption of maximizing expected utility. The main idea or assumption on which models have been put forward since the mid-1950s is that people will act rationally in the transactions they make or will make in the financial markets, because they are intelligent beings, they can access all relevant information and make transactions. solutions in such a way as to maximize their expected benefits in this context. However, the person at the center of the decision-making mechanism is not a robot or a machine. It is a living being with feelings, intuition, judgments and prejudices. Such behavioral and psychological factors prevent us from using all available information, making completely rational decisions, and striving only to maximize expected utility (Tekin, 2016). In short, it may be concluded that bias, conflicts and uncertainty are main factors affecting financial decisions. In this research, the main concepts for determinants of investment were examined in the perspective of confidence, risk, financial and digital literacy.

### **2.3.1. Confidence**

The most emphasized behavioral bias in the behavioral finance literature is the overconfidence bias. The fact that people have an overconfidence bias is one of the strongest findings in the field of psychology. Overconfidence refers to the overconfidence of people in their own abilities and knowledge in the psychology literature. Individuals are generally overconfident creatures. The majority of people who are faced with the decision-making phase at every moment of life tend to rely on their own knowledge and abilities in the decisions they will make. Studies in psychology and behavioral finance also support this (Tekin, 2018). At this point, over confidence becomes an important determinant of investment decision.

Overconfidence is not a uniform construct. Overestimation, overplacement, and overprecision are different from each other in many ways, big and small. They are not affected in the same way by different conditions. Furthermore, there does not appear to be a consistent personality trait that explains the differences in

overconfidence (Moore ve Schatz, 2017). Accuracy and integration of the model on different aspects of financial decision process becomes important at this point.

In traditional financial research, a model is first put forward and then the accuracy of that model is investigated through empirical research. In behavioral finance, one first observes patterns of behavior in the market, and then attempts to create a model that explains the patterns of behavior based on the results of these observations. Behaviorists argue that variables other than risk and return are considered by investors when making investment decisions, and that evaluating all variables is not a flawless process. If people are not rational, as predicted in traditional financial models, then what happens when the assumption of rationality is removed or applied more flexibly is the subject of behavioral finance (Tufan ve Sarıçık, 2013). This process is explained in Efficient Markets Hypothesis in detail.

A critique of the Efficient Markets Hypothesis, which was theoretically founded by Fama in 1960, emerged as an example of weak efficient markets. The reason that has made the trend popular in recent years is the failure of rational pricing in mortgage pricing during the 2008 crisis and the fact that there are human-specific perceptions in pricing. Behavioral Finance theory was later enriched by many academics and financiers and applied to all financial markets, and it was realized that the main reasons for market anomalies were human weaknesses (Sansar, 2016). However, traditional models focus on traditional decision making factors and conditions which affect these factors.

According to traditional models, competition among investors in the markets ensures that prices are formed rationally and that the expected return is balanced based on systematic risk. Even if some investors are far from rational, it is assumed that they will be balanced between their demands. Investors sometimes trade on rumors rather than information, and sometimes them over- or under-react to market information. When these emotional behaviors become systematic rather than random, they can become an extra source of risk in financial markets. In this way, cognitive biases arise from investor sentiment and affect investment decisions (Tufan and Sarıçık, 2013). Emotional factors are related with human psychology, and self confidence concept becomes important at this point.

The term self-confidence began to be heard for the first time in the psychology literature in the 1960s, and then it became a subject of academic studies in a wide range. It has also been stated by important researchers that the self-confidence bias, first defined by Oskamp (1965), affects the processes in various decision areas of life. Overconfidence is also referred to as a well-designed psychological theory. The main lines are; It consists of incomplete calibration, better-than-average effect, illusion of control, and unrealistic optimism. In the psychology literature, it is stated that overconfidence refers to the overconfidence of individuals in their own abilities and knowledge. Self-confidence arises as a result of a person's tendency to exaggerate their abilities, expectations of success, a positive outcome of events or the reliability of the information available to him, ignorance of the boundaries of his knowledge (Tekin, 2018). Behavioral finance explains deviations from informational market efficiency with the non-rational behavior of investors in the market. In other words, behavioral finance; It is about how human behavior is effective in the movement or functioning of stock prices. The criteria that financial models should be subject to can be summarized as follows (Barak, 2008):

Behavioral finance models,

- (1) It should be based on assumptions about investor behavior supported by empirical findings.
- (2) It should be able to explain the current anomaly findings concisely but comprehensively with a single model.
- (3) Be able to make additional predictions that can be tested and validated outside of the sample.

From the perspective of the finance literature, overconfidence has been studied mostly on the behavior of investors who transact in financial markets. The source of overconfidence bias is individuals' overconfidence in their own abilities, knowledge, and disregard for risk. Studies indicate that overconfident investors will have higher expected returns than rational investors and can derive more benefits. The reason is that overconfidence leads to aggressive investment. However, as the markets will close this gap over time, this advantage of the overconfidence bias will

be available to the first-mover investors with the overconfidence bias. Market trading volume will be quite high in the case of overconfident investors (Tekin, 2018).

### **2.3.2. Risk Appetite**

Individuals have to shop and make some financial decisions in order to meet their basic needs such as nutrition and clothing in their daily lives. Therefore, these financial decisions or financial behaviors also affect the financial situation of individuals. Of course, financial behavior is not the only factor affecting the financial situation, but financial behavior is one of the most important among these factors (Erişen ve Yılmaz, 2021). Although risk appetite may be seen as a unique concept, traditional and classical finance approaches may be found a little bit different.

Neoclassical finance accepts emotional assessments of risk as irrational, studies show that analytical causality is incomplete when emotion, conscious feelings and unconscious feelings are not taken into account. Studies make a clear distinction between emotion, conscious feelings, and unconscious feelings. unconscious feeling; It is an innate emotional response that an individual gives to external stimuli that he cannot control. Conscious feeling is the individual reaction to phenomena that develop with experience and are perceived by the senses. Emotion, on the other hand, is the feelings that develop with the social environment. First, unconscious feeling occurs, it becomes conscious by processing individually, and it manifests itself as emotion by developing socially (Aren, 2019). Bubbles and financial crises are also other important factors related with risk appetite and behavioral finance.

Emotional finance also tries to explain financial bubbles and crises that cannot be explained by traditional finance theory. There are several reasons why neoclassical finance cannot provide a satisfactory explanation on this issue. First, neoclassical finance treats individuals as independent units that are unaffected by each other. However, the behavior in the markets is the basic assumption group behavior. Second, neoclassical finance relies on mathematical models that take the future as risky. But financial markets are uncertain and ambiguous (Aren, 2019). Besides affecting, directing of a concept is also an important concept for behavioral finance.

There are also some factors that direct financial behavior. However, when we look at the national literature in this field, there are studies on financial literacy, the financial situation of individuals or only the spending habits of individuals. In addition, it is noteworthy that research on financial management behavior is not conducted using a measurement tool whose reliability and validity have been tested (Erişen ve Yılmaz, 2021).

The abundance of information creates uncertainty, not risk. While the neoclassical approach is based on rationality that assumes no emotions, it is emotions that dominate the markets. Finally, neoclassical finance believes that markets will stabilize themselves. However, financial bubbles and crises have shown that this is not true. It has been seen that risk and investment decision cannot be understood only with numerical values and economic motives (Aren, 2019). It may be concluded that risk appetite is one of the most important factors affecting financial behavior and investment decisions.

### **2.3.3. Financial Literacy**

Financial literacy is the entirety of financial knowledge, skills and behaviors which are necessary to ensure the financial well-being and security of individuals. Financial literacy is what an individual should have at a basic level in order to make rational decisions in the financial decision process. It includes information about simple mathematical operations, simple and compound interest calculations, inflation, time value of money, risk and expected return (Kılınç ve Kılıç, 2018).

Many new approaches, theories and hypotheses in financial markets have increased especially in the last hundred years. Many financiers and academic literature have tried to explain market anomalies in a cause-effect relationship, and the Efficient Market Hypothesis, Random Walk, Prospect Theory, etc., which have an important place in the financial world (Sansar, 2016). It may be suggested that all these theories are related with knowledge of individuals and financial literacy.

The level and structure of financial literacy in developed and developing countries is low and contributes to growing wealth inequality. The benefits of

increasing financial literacy include more effective saving for retirement (Michaud, 2017). A financially literate person means an individual having some basic knowledge on financial and economic concepts (OECD, 2012). According to other approach, financial literacy is clearly linked to greater financial literacy, and there is a positive interaction between financial literacy and experience. Financial literacy may position individuals for greater increases in financial literacy over time (Yakoboski et al, 2021). Thus, it may be argued that financial literacy is related with rationality and experiences of investors.

Most of the investment decisions in the financial sector follow a rational process until a breaking point, but when the breaking point is reached, the rationality process becomes debatable. After this breaking point in financial markets is passed, it is possible for a professional investor to affect his market transactions by psychological forces (Kılınç ve Kılıç, 2018). Perceptions of the relative risk of cryptocurrencies and other alternative assets are used to explain and describe the established correlation between financial literacy and attitudes towards cryptocurrencies (Panos et al, 2020). The other important factor related with financial literacy is reflection and education.

One of the most important parts of today's economy is the financial markets. Financial markets are the first place where economic development is reflected. It is people who make investment decisions in these markets and who use their decisions to determine the direction of the market (Kılınç ve Kılıç, 2018). Financial literacy refers for individuals to learn and to understand the meaning of money and how it is used (Williams, 2019). According to this approach, financial literacy may be seen as an important term and knowledge to ensure the sustainable development of society and individuals (Swiecka et al, 2020). In other words, financial literacy is an individual concept and value, but affects all society.

The ability to provide informed, conscious and efficient financial decisions seems to be particularly important. Some recent trends are converging to show a real need to foster and improve individuals' financial literacy (Bongini et al, 2018). Traditional finance has developed based on two basic assumptions: expected utility and rational choice. However, these assumptions have been heavily criticized for not

being realistic enough. Behavioral finance is based on expectancy theory. According to this theory, individuals cannot act fully rationally and attribute more meaning to losses than gains in the same amount, and they show risk and loss aversion behavior. Behavioral finance aims to provide a more realistic understanding of the reasoning patterns that individuals use in their financial decision-making processes by including their behavioral and emotional patterns in their decision-making processes (Tekin, 2016). In both decision and investment processes, knowledge and its indicator, financial literacy plays important role.

Individuals with a high level of financial literacy make financial decisions in a way that will increase their welfare level. This situation also contributes to the development of the financial system, increasing the country's resilience against possible crises. Many countries in the world, which have implemented studies and policies to increase the welfare level of the country, have started to follow policies to increase the level of financial literacy (Kılıç ve Kılıç, 2018).

Measurable financial approaches have evolved and taken a new form today. The models and equations created by classical finance theories to explain financial behaviors have resulted in behavioral finance as a result of monitoring that investors do not act rationally as in the assumptions in these models (Sansar, 2016). Thus, it may be argued that financial approaches, their reliability and measurability are related with financial literacy.

In making these decisions, people take a position with a similar psychology in that they experience the basic characteristics of psychology that they encounter in everyday life in their investing decisions. While the evolution of the thinking brain of human beings goes back many years, the feeling brain has remained as the most primitive equipment of humanity. The question of how the thinking brain and the feeling brain move during periods of high volatility in financial markets are of great importance (Kılıç ve Kılıç, 2018). In conclusion, it may be argued that financial literacy is the most important part of decision making process in financial sectors, and also reflects society.

#### **2.3.4. Digital Literacy**

Digital literacy is a concept that has recently entered the literature compared to other concepts. In its most general definition, the term, which means reading digital information and data, also corresponds to a concept that includes the knowledge and experiences of individuals regarding digital content and their ability to transfer these experiences to daily life.

Since digital literacy skills include high-level skills, the use of alternative and authentic assessment tools in the assessment of personal development leads to more effective results. Along with the constructivist approach, alternative and authentic assessment tools were used (Aydemir et al, 2019). An important part of development of an effective digital literacy is that digital competence has practical value in the accomplishment of a wide range of tasks. In addition, the development of digital literacy enables people to participate in community activities and undertake social activities online (Hobbs, 2010). In basic level, digital literacy may be related with taking information from digital signals or reading instructions.

Reading instructions on graphic screens, as well as creating new meaningful materials in this environment, assessing the quality and reliability of information in the digital environment are among the activities of digital literacy. Digital literacy, which will be taken as a measure in assessing the quality of learning activities in the digital environment, also supports a user-centric approach (Karabacak ve Sezgin, 2019). As a result, digital literacy is becoming increasingly important for digital inclusion and digital citizenship. Many people take for granted the knowledge of using computers and the Internet to perform basic tasks (Lee, 2014). It may be concluded that increase in computer technology is the most important factor affecting digital literacy.

In another definition, digital literacy can be expressed as the ability to perceive, analyze and evaluate transmissions and messages conveyed by written and visual media and acquire the ability to send appropriate messages into this process. With the growth of mass media, the volume of information and messages transmitted to a person through these channels has increased (Kardeş, 2020). Five essential skills required for digital and media literacy. They are to develop, analyze and reflect,

design, evaluate and to act. These skills are aligned with this proposed study, which also suggests five key digital literacy skills people should develop: operations, usage, communication and interaction, creation and analysis (Hobbs, 2010). Thus, digital literacy is also related with skills of individuals.

In digital literacy approach, it is recommended to use open-ended questions and examples related to everyday life, as well as multiple choice tests. open questions; These are the most appropriate question types for measuring high-level skills such as problem solving, problem organizing, generating new and original ideas, evaluating ideas, establishing cause and effect relationships, summarizing, hypothesizing, and making judgments by comparing them (Aydemir et al, 2019). In the financial industry, the application of digital technologies is commonly known as financial technology or fintech. Although fintech is growing strongly, Indonesia still has weak regulation in this digital financial technology (Setiawan et al, 2020). Digital literacy should not be limited to the use of a digital device or software. Digital literacy includes the complex cognitive, sociological and emotional skills that users need to work effectively in a digital environment (Karabacak ve Sezgin, 2019).

The increase in the volume of transmitted information and messages has led to information pollution. Media and mass media is a process in which the information to be presented to the person is designed in advance and the message to be delivered to the person is planned. In this process, a person cannot think freely and becomes passively receptive (Kardeş, 2020). In conclusion, it may be argued that the main driven force for digital literacy is increase in usage of computers in daily life, and digital literacy is a kind of ability level of individuals on digital issues.

### **3. MATERIAL AND METHODS**

In this chapter, model of the research, data collection tools, research questions, hypothesis and statistical method sections were given.

#### **3.1. Model of the Research**

The research was conducted on descriptive survey method. In this method, an argument or a statement was measured by researcher without any interventions with quantitative data (Karasar, 2012). In the research, crypto coin investment decisions of banking sector workers were descriptively measured, and results were interpreted.

#### **3.2. Problem Statement and Research Questions**

The main problem of the research was conducted as following:

Do digital literacy and financial literacy levels have significant effect on crypto coin investment?

Based on this main research question, following research questions were examined:

**S1:** Are there statistically significant differences between demographic properties of crypto-currency investors and non-investors?

**S2:** Are there statistically significant differences between confidence levels of crypto-currency investors and non-investors?

**S3:** Are there statistically significant differences between risk levels of crypto-currency investors and non-investors?

**S4:** Are there statistically significant financial literacy score differences between crypto-currency investors and non-investors?

**S5:** Are there statistically significant digital literacy score differences between crypto-currency investors and non-investors?

**S6:** Does financial literacy levels have significant effect on crypto currency investing decision?

**S7:** Does digital literacy levels have significant effect on crypto currency investing decision?

### **3.3. Hypothesis**

Following hypothesis were tested according to research questions:

**H1:** There are statistically significant differences between demographic properties of crypto-currency investors and non-investors.

**H2:** There are statistically significant differences between confidence levels of crypto-currency investors and non-investors.

**H3:** There are statistically significant differences between risk levels of crypto-currency investors and non-investors.

**H4:** There are statistically significant financial literacy score differences between crypto-currency investors and non-investors.

**H5:** There are statistically significant digital literacy score differences between crypto-currency investors and non-investors.

**H6:** Financial literacy levels have significant effect on crypto currency investing decision.

**H7:** Digital literacy levels have significant effect on crypto currency investing decision.

### **3.4. Sampling**

The universe of the study includes banking sector workers in Istanbul in 2021, and sample of the study includes 443 banking sector workers with voluntary participation method. Related permissions and consent form were taken before gathering data.

Cohen et al (2001) reported that minimum 384 participants represent a universe between 1 to 5 million statistical units. Although number of banking sector workers in Istanbul are not more than 1.000.000, the research sample was over this universe representation. This shows that sample size of the study has higher presentation level.

### 3.5. Scale Reliability and Validity Analysis Results

In order to evaluate reliability and validity of the research scales, Cronbach alpha internal consistency reliability and Confirmatory Factor Analysis (CFA) was performed. For financial literacy evaluation, Financial Literacy Scale developed by Kayacan (2019) was used. For digital literacy evaluation, Digital Literacy Scale developed by Üstündağ et al (2017) was used. Both scales have 10 items with one dimension and five-likert scale.

#### 3.5.1. Reliability results

Cronbach Alpha levels and interconsistency analysis results for Financial Literacy Scale were given in the Table 3.1.

**Table 3. 1. Cronbach Alpha levels and inter-consistency analysis results for Financial Literacy Scale**

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
FL1	29.07	51.968	0.334	0.698
FL2	30.87	55.432	0.178	0.723
FL3	29.87	50.280	0.457	0.677
FL4	29.36	55.538	0.143	0.732
FL5	29.51	46.079	0.715	0.634
FL6	29.49	46.477	0.694	0.638
FL7	30.59	56.415	0.109	0.737
FL8	29.54	46.222	0.712	0.635
FL9	28.96	53.021	0.308	0.702
FL10	29.73	54.094	0.257	0.710
<b>Total: 0.713</b>				

All items in the scale and total inter-consistency level Cronbach Alpha were over 0.70, which is reference for literature. These results showed that the scale had high reliability.

Cronbach Alpha levels and interconsistency analysis results for Digital Literacy Scale were given in the Table 3.2.

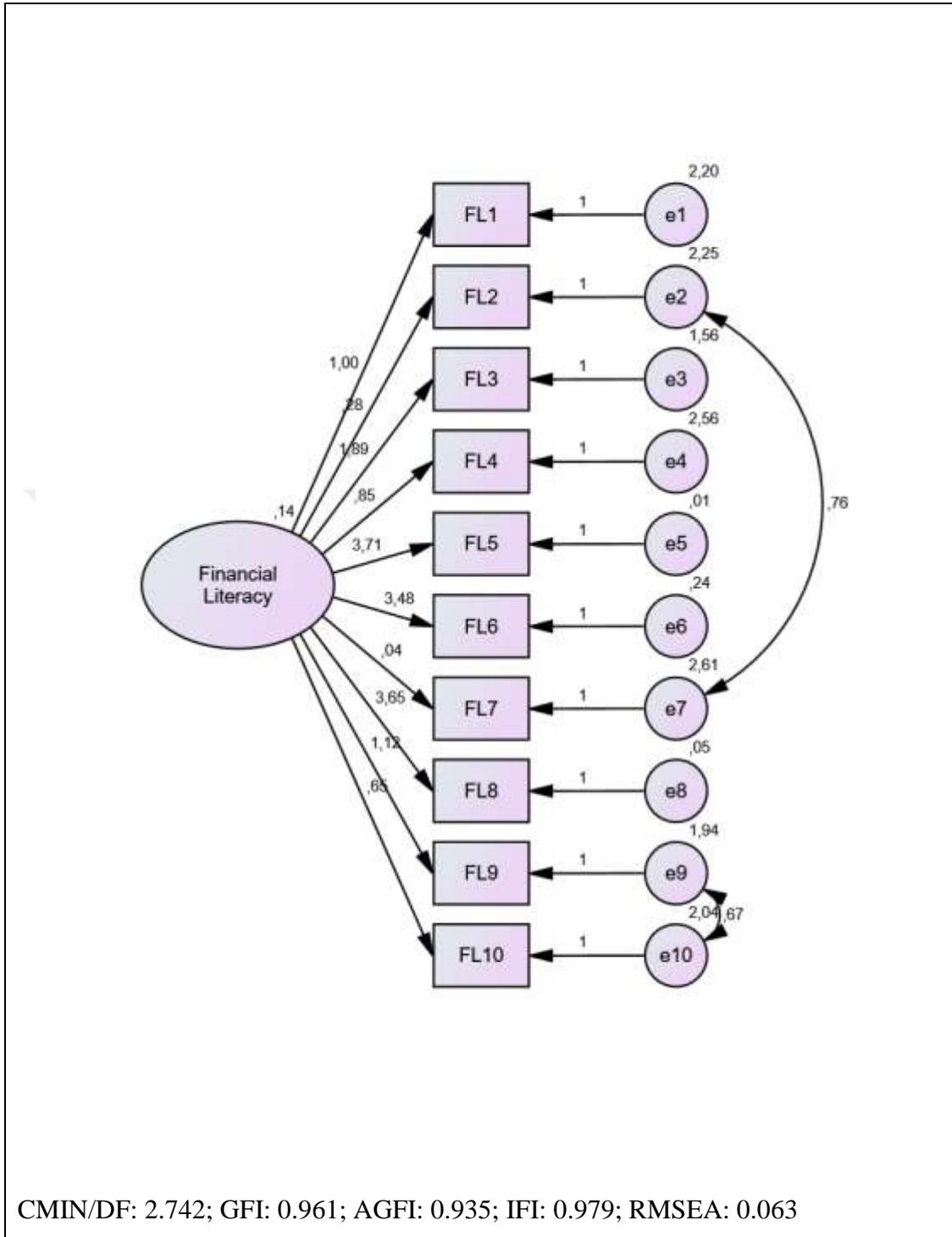
**Table 3. 2. Cronbach Alpha levels and interconsistency analysis results for Digital Literacy Scale**

	<b>Scale Mean if Item Deleted</b>	<b>Scale Variance if Item Deleted</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
DL1	33.51	49.526	0.660	0.864
DL2	33.37	49.971	0.723	0.861
DL3	33.41	49.741	0.699	0.862
DL4	33.78	48.460	0.713	0.860
DL5	33.94	49.759	0.571	0.871
DL6	34.07	50.730	0.556	0.872
DL7	33.39	50.922	0.620	0.867
DL8	33.67	50.089	0.581	0.870
DL9	33.63	50.641	0.676	0.864
DL10	34.09	51.738	0.377	0.889
<b>Total: 0.880</b>				

Similar with Financial Literacy Scale, all items in the Digital Literacy Scale and total inter-consistency level Cronbach Alpha were over 0.88, which is reference for literature. These results showed that the scale had high reliability.

### **3.5.2. Validity Results**

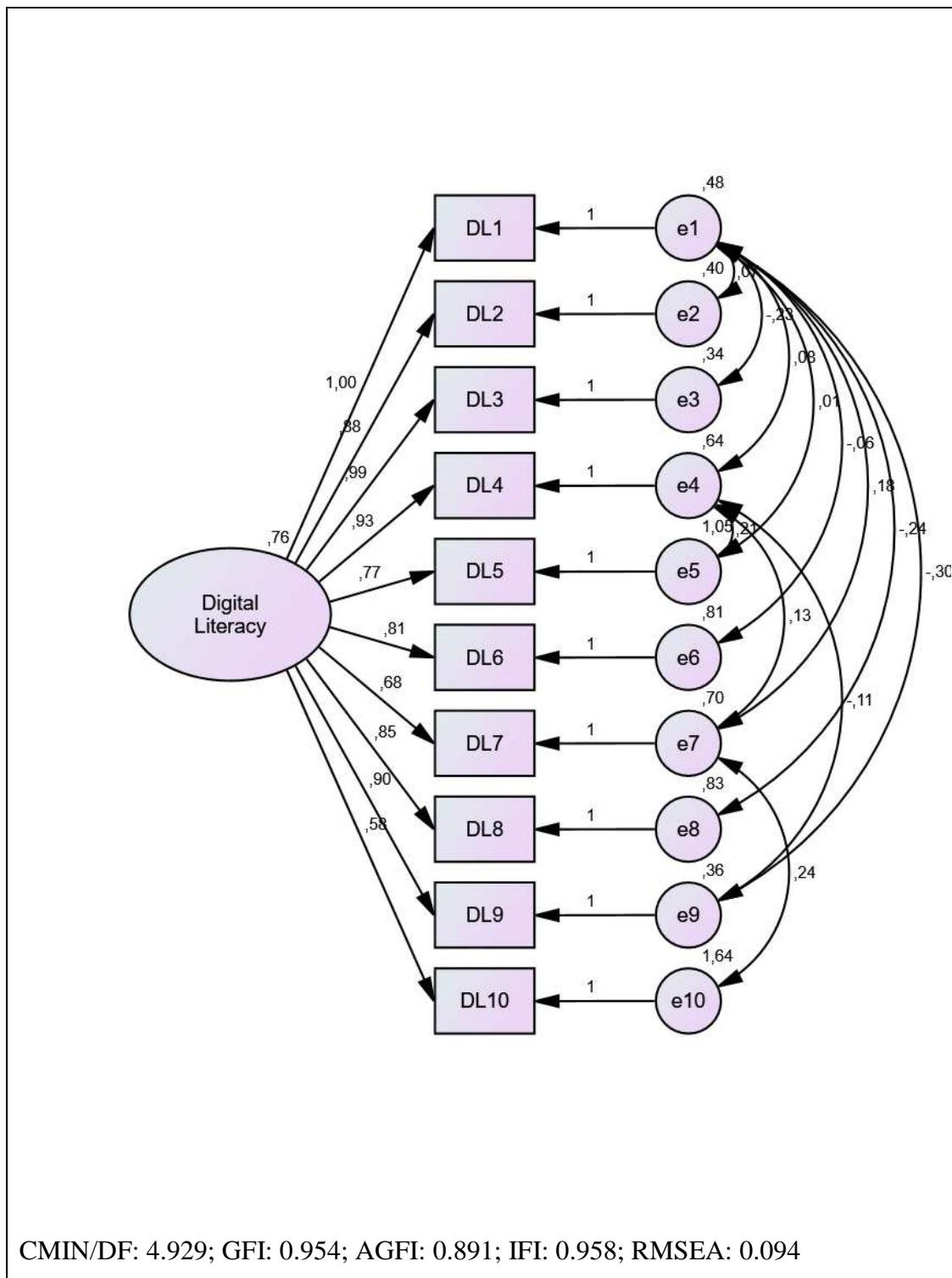
Validity analysis results for Financial Literacy Scale were given in the Scheme 3.1.



**Scheme 3. 1. Confirmatory Factor Analysis results for Financial Literacy Scale**

Confirmatory Factor Analysis results showed that Financial Literacy Scale items and total item inter-consistency rates were high, and showed high validity for all items.

Confirmatory Factor Analysis results for Digital Literacy Scale were given in the Scheme 3.2.



**Scheme 3. 2. Confirmatory Factor Analysis results for Digital Literacy Scale**

Similar with Financial Literacy Scale, Digital Literacy Scale items and total item inter-consistency rates were high, and showed high validity for all items.

### **3.6. Statistical Analysis**

Nominal and ordinal parameter descriptions were performed with frequency analysis, whereas scale parameters were described with means and standard deviations. In order to evaluate reliability and validity of the research scales, Cronbach alpha internal consistency reliability and Confirmatory Factor Analysis (CFA) was performed. Kolmogorov Smirnov Test was used for normality of research parameters. Mann Whitney U test was used for differences of scale parameters. Fischer's Exact Test, Chi-Square Test and Chi-Square Likelihood Ratio tests were used for differences between categorical parameters. Spearman's rho correlation analysis was used for relationship analysis. Binary Logistic Regression Analysis was used for effect and multivariate analysis. SPSS 17.0 for windows and AMOS 24.0 for windows programs were used for analysis of the research.

## 4. RESULTS

Analysis results of the data gathered from sample of the study was given in this section.

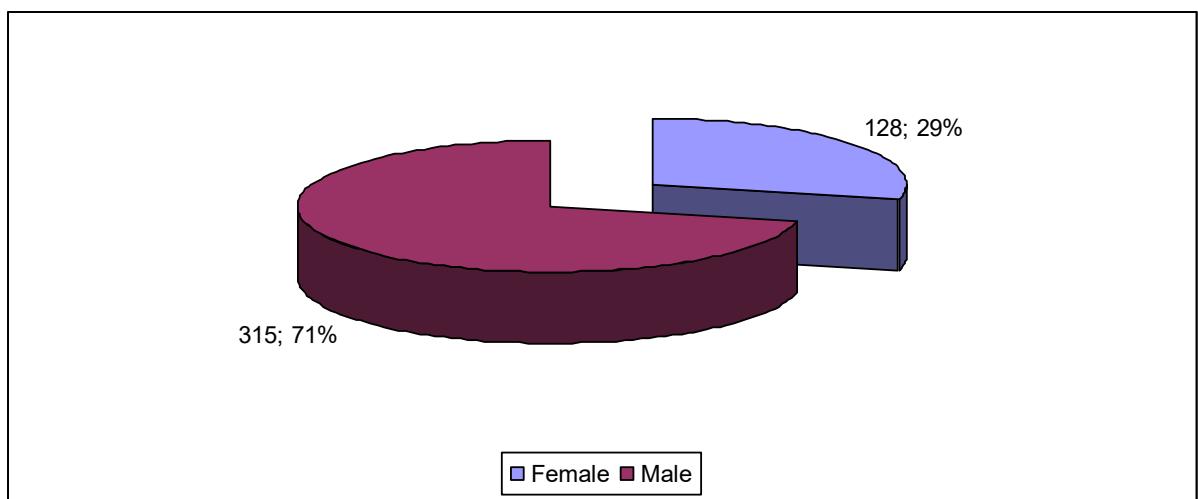
### 4.1. Demographic Properties

Gender, age, education, income, marital status, confidence level, risk level and crypto currency taking status were asked as demographic properties. Firstly, gender distribution of participants was given in the Table 4.1.

**Table 4. 1. Gender distribution of participants**

	Frequency (n)	Percent (%)
Females	128	28.9
Males	315	71.1
Total	443	100.0

28.9% of participants were female, and 71.1% were male. This distribution was shown in the Scheme 4.1.



**Scheme 4. 1. Gender distribution of participants**

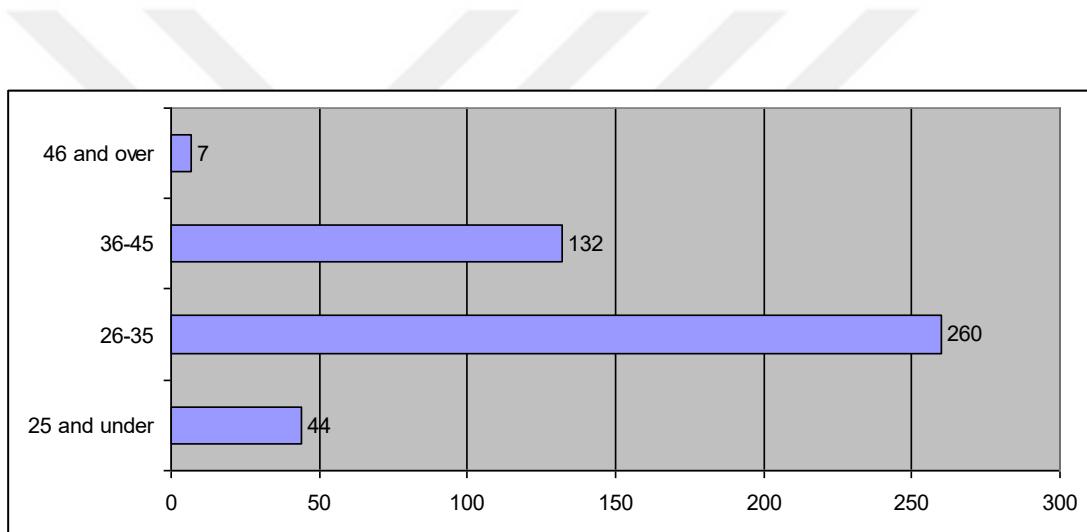
Scheme 4.1 showed that male participants were more common than female participants. This distribution was also in accordance of gender distribution of banking sector.

Age distribution of participants was given in the Table 4.2.

**Table 4. 2. Age distribution of participants**

	<b>Frequency (n)</b>	<b>Percent (%)</b>
25 and under	44	9.9
26-35	260	58.7
36-45	132	29.8
46 and over	7	1.6
Total	443	100.0

9.9% of participants had 25 and under, 58.7% had 26-35, 29.8% had 36-45, 1.6% had 46 and over ages. This distribution was also shown in the Scheme 4.2.



**Scheme 4. 2. Age distribution of participants**

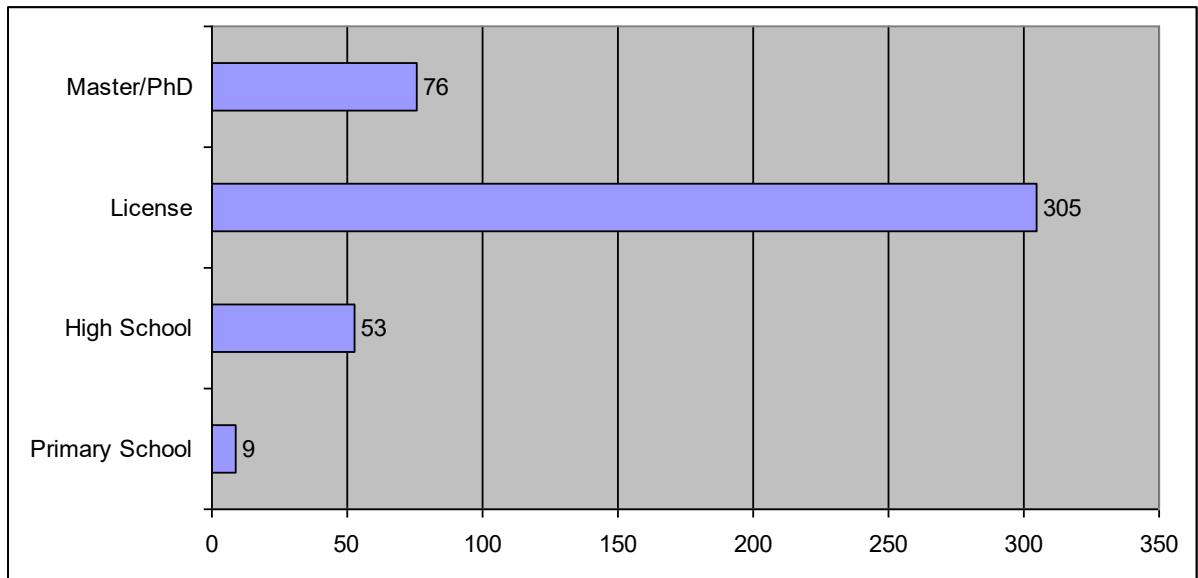
Most of the participants had 26-35 ages, followed by 36-45 ages. This means that sample of the study had young ages.

Education distribution of participants was given in the Table 4.3.

**Table 4. 3. Education distribution of participants**

	<b>Frequency (n)</b>	<b>Percent (%)</b>
Primary School	9	2.0
High School	53	12.0
License	305	68.8
Master/PhD	76	17.2
Total	443	100.0

2.0% of participants had primary school, 12.0% had high school, 68.8% had license and 17.2% had master/PhD level education. This distribution was shown in the Scheme 4.3.



**Scheme 4. 3. Education distribution of participants**

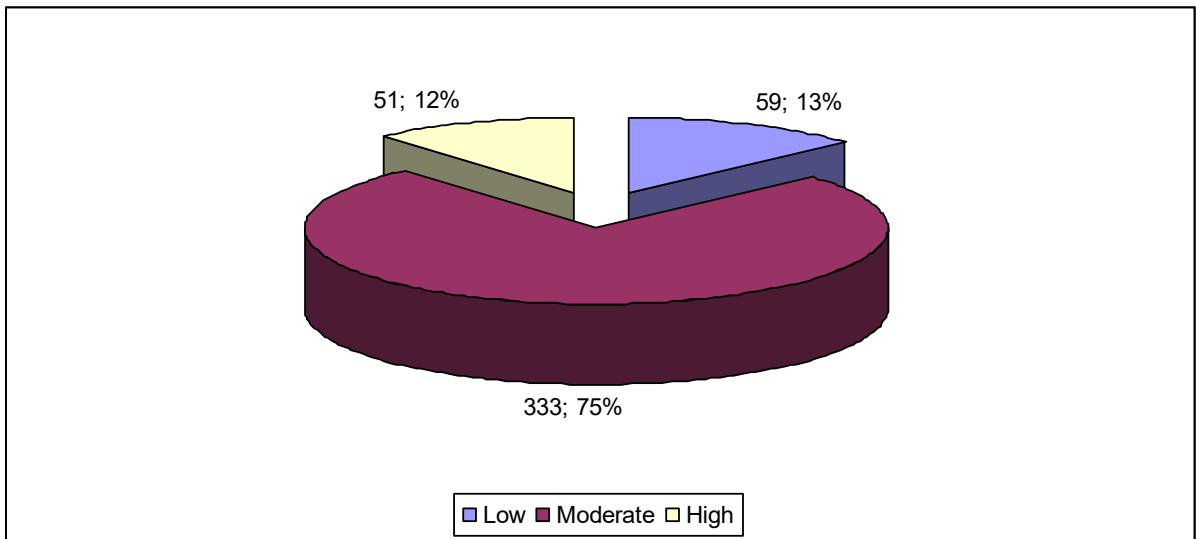
Most of the participants had license level education, followed by master/PhD level education.

Income distribution of participants was given in the Table 4.4.

**Table 4. 4. Income distribution of participants**

	Frequency (n)	Percent (%)
Low	59	13.3
Moderate	333	75.2
High	51	11.5
Total	443	100.0

13.3% of participants had low, 75.2% had moderate and 11.5% had high income profile. This distribution was shown in the Scheme 4.4.



**Scheme 4. 4. Income distribution of participants**

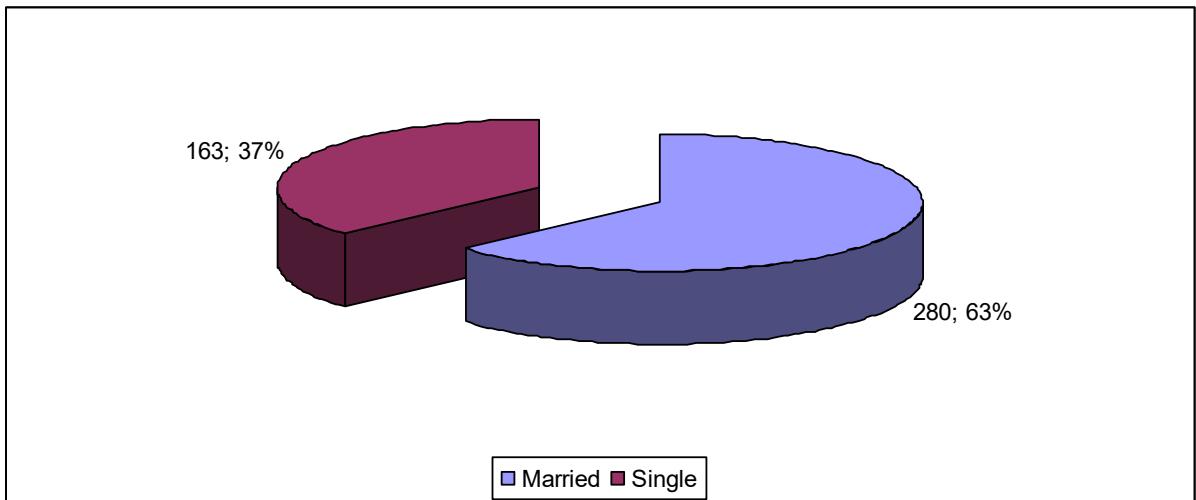
Most of the participants described themselves as moderate income status. In Turkey, it may be argued that this distribution was in accordance with banking sector wages.

Marital status distribution of participants was given in the Table 4.5.

**Table 4. 5. Marital status distribution of participants**

	Frequency (n)	Percent (%)
Married	280	63.2
Single	163	36.8
Total	443	100.0

63.2% of participants were married, and 36.8% were single. This distribution was also shown in the Scheme 4.5.



**Scheme 4. 5. Marital status distribution of participants**

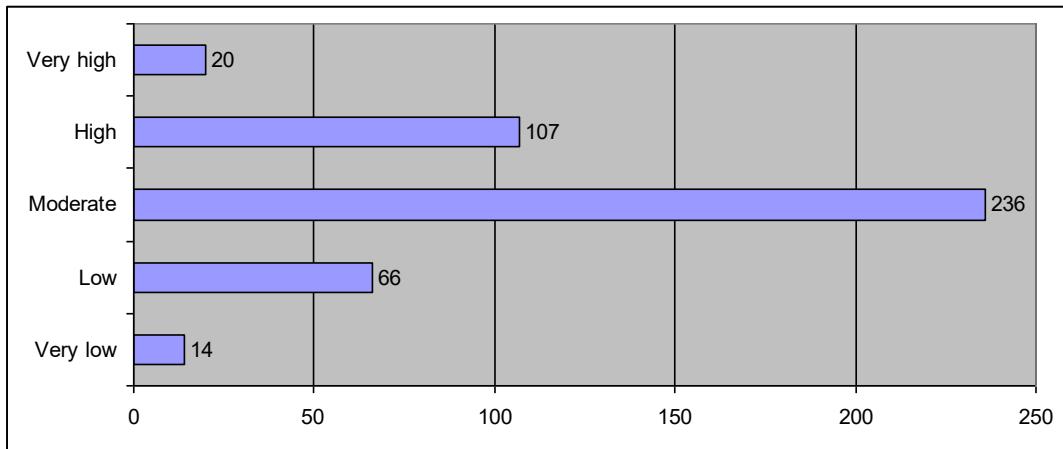
Scheme 4.5 showed that more than half of the participants were married, and single participants were about to 37.0%.

Confidence level distribution of participants was given in the Table 4.6.

**Table 4. 6. Confidence level distribution of participants**

	Frequency (n)	Percent (%)
Very low	14	3.2
Low	66	14.9
Moderate	236	53.3
High	107	24.2
Very high	20	4.5
Total	443	100.0

3.2% of participants had very low, 14.9% had low, 53.3% had moderate, 24.2% had high and 4.5% had very high level of confidence. This distribution was shown in the Scheme 4.6.



**Scheme 4. 6. Confidence level distribution of participants**

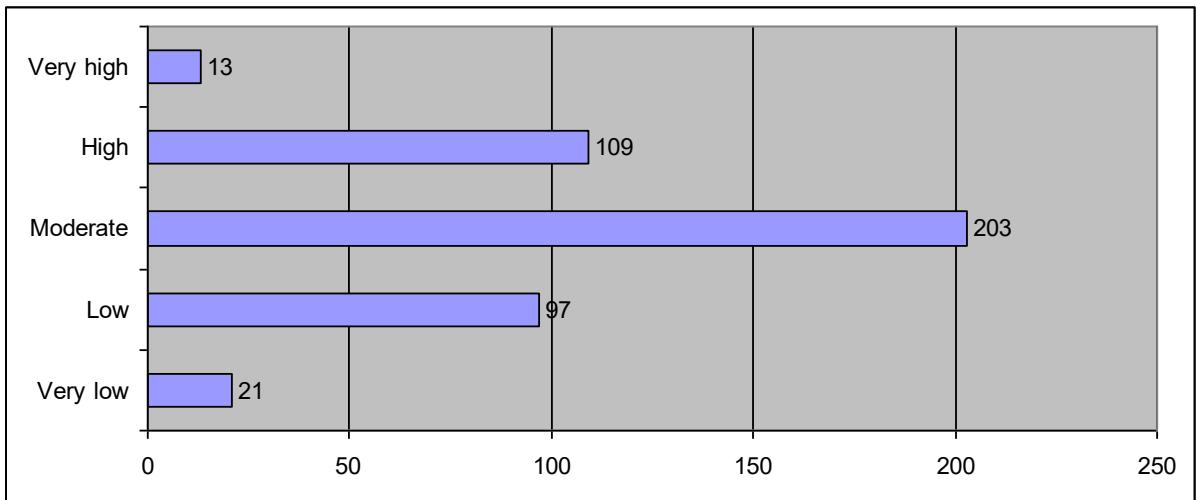
Most of the participants stated that they have moderated confidence, followed by high and low.

Risk distribution of participants was given in the Table 4.7.

**Table 4. 7. Risk distribution of participants**

	Frequency (n)	Percent (%)
Very low	21	4.7
Low	97	21.9
Moderate	203	45.8
High	109	24.6
Very high	13	2.9
Total	443	100.0

4.7% of participants had very low, 21.9% had low, 45.8% had moderate, 24.6% had high and 2.9% had very high level of risk. This distribution was shown in the Scheme 4.7.



**Scheme 4. 7. Risk distribution of participants**

Most of the participants stated that they have moderated risks, followed by high and low.

Investing coin distribution of participants was given in the Table 4.8.

**Table 4. 8. Investing coin distribution of participants**

	Frequency (n)	Percent (%)
No	254	57.3
Yes	189	42.7
Total	443	100.0

About 57.3% of participants stated that they do not invest on crypto coin, and 42.7% stated that they invest on crypto coin. Investing sub-coin distribution of participants was given in the Table 4.9.

**Table 4. 9. Investing sub-coin distribution of participants**

	Frequency (n)	Percent (%)
No	235	53.0
Yes	208	47.0
Total	443	100.0

53.0% of participants stated that they do not invest on sub-coin, and 47.0% stated that they invest on crypto coin.

## 4.2. Scale Means

Financial Literacy Scale item and total score means were given in the Table 4.10.

**Table 4. 10. Financial Literacy Scale item and total score means**

	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
FL1		1	5	3.93
FL2		1	5	2.13
FL3		1	5	3.13
FL4		1	5	3.64
FL5		1	5	3.49
FL6		1	5	3.50
FL7		1	5	2.41
FL8		1	5	3.46
FL9		1	5	4.04
FL10		1	5	3.27
Financial literacy	14.00	50.00	33.00	7.85

According to Table 4.10, item scores were ranged between 2.13 and 4.04. Total score was ranged from 14.00 to 33.00 with  $33.00 \pm 7.85$  mean.

Digital Literacy Scale item and total score means were given in the Table 4.11.

**Table 4. 11. Digital Literacy Scale item and total score means**

	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
DL1		1	5	3.92
DL2		1	5	4.06
DL3		1	5	4.02
DL4		1	5	3.65
DL5		1	5	3.49
DL6		1	5	3.36
DL7		1	5	4.04
DL8		1	5	3.76
DL9		1	5	3.80
DL10		1	5	3.34
Digital literacy	12.00	50.00	37.43	7.82

Table 4.11 showed that item scores were ranged between 3.34 and 4.06. Total score was ranged from 12.00 to 33.00 with  $37.43 \pm 7.82$  mean.

### 4.3. Hypothesis Tests

Before hypothesis tests, Kolmogorov Smirnov test was performed for normality analysis of financial and digital literacy means. Results were given in the Table 4.12.

**Table 4. 12. Kolmogorov Smirnov normality test results of scale scores**

	Financial literacy	Digital literacy
N	443	443
Mean	33.00	37.43
Std. Deviation	7.85	7.82
Absolute	0.07	0.06
Positive	0.04	0.05
Negative	-0.07	-0.06
Kolmogorov-Smirnov Z	1.56	1.37
p	0.015	0.048

Both financial literacy and digital literacy scale score distributions were significantly different from normal distribution ( $p < 0.05$ ). Thus, nonparametric tests were used for hypothesis tests.

#### 4.3.1. Demographic Differences between Crypto-Currency Investors and Non-Investors

Following hypothesis was tested for demographic differences between crypto-currency investors and non-investors:

**H1:** There are statistically significant differences between demographic properties of crypto-currency investors and non-investors

**Table 4. 13. Demographic Differences between Crypto-Currency Investors and Non-Investors**

	Non-investors		Investors		X <sup>2</sup>	p value
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)		
<b>Gender</b>						
Female	102	40.2	26	13.8	36.763	0.000 <sup>a</sup>
Male	152	59.8	163	86.2		
<b>Age</b>						
25 and under	26	10.2	18	9.5		
26-35	140	55.1	120	63.5	10.013	0.018 <sup>b</sup>
36-45	81	31.9	51	27.0		
46 and over	7	2.8	-	-		
<b>Education</b>						
Primary School	5	2.0	4	2.1		
High School	25	9.8	28	14.8	4.502	0.212 <sup>b</sup>
License	174	68.5	131	69.3		
Master/PhD	50	19.7	26	13.8		
<b>Income</b>						
Low	29	11.4	30	15.9		
Moderate	210	82.7	123	65.1	22.337	0.000 <sup>c</sup>
High	15	5.9	36	19.0		
<b>Marital status</b>						
Married	163	64.2	117	61.9	0.240	0.348 <sup>a</sup>
Single	91	35.8	72	38.1		

a. Fischer's Exact Test, b. Chi-Square Likelihood Ratio, c. Chi-Square.

Males more invest crypto currency than females with statistically significant difference ( $p<0.05$ ). Age distribution of crypto currency investors were lower, showing that young participants invest crypto currency with statistically significant difference ( $p<0.05$ ). Education and marital status differences were insignificant ( $p>0.05$ ). High income participants were more keen to invest crypto currency with statistically significant difference ( $p<0.05$ ). Three of five demographic properties showed significant differences, and thus, **H1** hypothesis was accepted. In other

words, there are statistically significant differences between demographic properties of crypto-currency investors and non-investors.

#### 4.3.2. Confidence Differences between Crypto-Currency Investors and Non-Investors

Following hypothesis was tested for confidence differences between crypto-currency investors and non-investors:

**H2:** There are statistically significant differences between confidence levels of crypto-currency investors and non-investors.

**Table 4. 14. Confidence Differences between Crypto-Currency Investors and Non-Investors**

	Non-investors		Investors		$\chi^2$	p value
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)		
Very low	11	4.3	3	1.6		
Low	54	21.3	12	6.3		
Moderate	141	55.5	95	50.3	36.641	0.000
High	39	15.4	68	36.0		
Very high	9	3.5	11	5.8		

Table 4.14 showed that participants who had higher confidence level were keen to invest crypto currency with statistically significant difference ( $p<0.05$ ). Thus, **H2** hypothesis of the research was accepted. In other words, there are statistically significant differences between confidence levels of crypto-currency investors and non-investors.

#### 4.3.3. Risk Differences between Crypto-Currency Investors and Non-Investors

Following hypothesis was tested for risk differences between crypto-currency investors and non-investors:

**H3:** There are statistically significant differences between risk levels of crypto-currency investors and non-investors.

**Table 4. 15. Risk Differences between Crypto-Currency Investors and Non-Investors**

	Non-investors		Investors		$\chi^2$	p value
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)		
Very low	19	7.5	2	1.1		
Low	64	25.2	33	17.5		
Moderate	139	54.7	64	33.9	73.304	0.000
High	26	10.2	83	43.9		
Very high	6	2.4	7	3.7		

According to Table 4.15, participants who had higher risk level were keen to invest crypto currency with statistically significant difference ( $p<0.05$ ). Thus, **H3** hypothesis of the research was accepted. In other words, there are statistically significant differences between risk levels of crypto-currency investors and non-investors.

#### 4.3.4. Financial Literacy Score Differences between Crypto-Currency Investors and Non-Investors

Following hypothesis was tested for financial literacy score differences between crypto-currency investors and non-investors:

**H4:** There are statistically significant financial literacy score differences between crypto-currency investors and non-investors.

**Table 4. 16. Financial Literacy Score Differences between Crypto-Currency Investors and Non-Investors**

Non-investors		Investors		U	p value
Mean	Std. Deviation	Mean	Std. Deviation		
32.65	7.36	33.46	8.47	22350.500	0.215

U: Mann Whitney U Test.

Financial literacy score of crypto currency investors were higher than non-investors. However, differences between groups were statistically insignificant ( $p>0.05$ ). Thus, **H4** hypothesis of the research was rejected. In other words, there are

not statistically significant financial literacy score differences between crypto-currency investors and non-investors.

#### 4.3.5. Digital Literacy Score Differences between Crypto-Currency Investors and Non-Investors

Following hypothesis was tested for digital literacy score differences between crypto-currency investors and non-investors:

**H5:** There are statistically significant digital literacy score differences between crypto-currency investors and non-investors.

**Table 4. 17. Digital Literacy Score Differences between Crypto-Currency Investors and Non-Investors**

Non-investors		Investors		U	p value
Mean	Std. Deviation	Mean	Std. Deviation		
36.04	8.02	39.30	7.14	17948.500	0.000

U: Mann Whitney U Test.

Digital literacy score of crypto currency investors ( $39.30 \pm 7.14$ ) were higher than non-investors ( $36.04 \pm 8.02$ ). Mann Whitney U test results showed that differences between groups were statistically significant ( $p < 0.05$ ). Thus, **H5** hypothesis of the research was accepted. In other words, there are statistically significant digital literacy score differences between crypto-currency investors and non-investors.

#### 4.3.6. Effect of Financial and Digital Literacy Levels on Crypto Currency Investing Decision

Following hypothesis were tested for effect of financial and digital literacy levels on crypto currency investing decision:

**H6:** Financial literacy levels have significant effect on crypto currency investing decision.

**H7:** Digital literacy levels have significant effect on crypto currency investing decision.

Before binary logistic regression test, Spearman's rho correlation was performed to analyze cofounders. Results were given in the Table 4.18.

**Table 4. 18. Spearman's rho test for correlation between crypto currency investing and cofounders**

Crypto coin investing	r	p
Gender	0.288**	0.000
Age	-0.070	0.142
Education	-0.097*	0.041
Income	0.084	0.076
Marital status	0.023	0.625
Confidence	0.290**	0.000
Risk	0.332**	0.000
Financial literacy	0.059	0.215
Digital literacy	0.216**	0.000

\*p<0.05 \*\*p<0.01

Spearman's rho correlation analysis results showed that there were significant and positive correlations between crypto coin investing and gender ( $r=0.288$ ;  $p<0.01$ ), confidence ( $r=0.290$ ;  $p<0.01$ ), risk ( $r=0.332$ ;  $p<0.01$ ) and digital literacy ( $r=0.216$ ;  $p<0.01$ ). There was significant and negative correlations between crypto coin investing and education ( $r=-0.097$ ;  $p<0.05$ ).

Binary logistic regression analysis results for crypto coin investing were given in the Table 4.19.

**Table 4. 19. Effects of Financial and Digital Literacy Levels on Crypto Currency Investing Decision**

	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>p</b>	<b>Exp(B)</b>	<b>95% C.I.for</b>	
						<b>EXP(B)</b>	<b>Lower</b>
Gender(1)	-1.206	0.278	18.830	<b>0.000</b>	0.299	0.174	0.516
Education			5.840	0.120			
Education(1)	1.280	0.766	2.791	0.095	3.598	0.801	16.156
Education(2)	0.698	0.439	2.522	0.112	2.009	0.849	4.753
Education(3)	0.729	0.330	4.895	<b>0.027</b>	2.073	1.087	3.955
Confidence			15.665	<b>0.004</b>			
Confidence(1)	0.713	1.144	0.389	0.533	2.040	0.217	19.203
Confidence(2)	-1.631	0.834	3.824	0.051	0.196	0.038	1.004
Confidence(3)	-0.100	0.728	0.019	0.891	0.905	0.217	3.769
Confidence(4)	0.345	0.726	0.226	0.635	1.412	0.341	5.854
Risk			35.452	<b>0.000</b>			
Risk(1)	-2.553	1.223	4.355	<b>0.037</b>	0.078	0.007	0.856
Risk(2)	-0.050	0.879	0.003	0.954	0.951	0.170	5.320
Risk(3)	-1.035	0.827	1.567	0.211	0.355	0.070	1.796
Risk(4)	0.572	0.815	0.492	0.483	1.771	0.359	8.751
Digital literacy	0.044	0.015	8.366	<b>0.004</b>	1.045	1.014	1.076
Constant	-1.641	0.936	3.073	0.080	0.194		

Binary logistic regression analysis results showed that gender, being master/PhD graduated, confidence, very low risk and digital currency had significant effect on crypto coin investment ( $p<0.05$ ). However, effect of financial literacy was statistically insignificant ( $p>0.05$ ). Thus, **H6** hypothesis of the research was rejected, and **H7** hypothesis was accepted. In other words, financial literacy levels have insignificant effect on crypto currency investing decision, whereas digital literacy levels have significant effect on crypto currency investing decision.

## 5. DISCUSSION

In this research, it was aimed to evaluate effects of behavioral bias on crypto currency investment decisions. Since crypto currency investment is a respectively new concept, and there have not been enough literature on this area, the study may be seen as a preliminary study.

In literature, a few researches were conducted on effect of gender on investing decision (Skonieczna ve Castellano, 2020; GSI, 2020). However, it may be argued that males are keener to invest than females, due to patriarchal structure of societies. In this research, it was found that males more invest crypto currency than females with statistically significant difference ( $p<0.05$ ). The main reason for this result may be the fact that males are more common than females in working life in banking sector.

Crypto currency is respectively a new investment device among others. There have been many researches conducted on crypto currency whether its value for currency or global value in long term (Atzei vd, 2017; Chohan, 2017). In this research, it was found that age distribution of crypto currency investors were lower ( $p<0.05$ ). The main reason for this result may be the fact that new generations are more interest in technology and internet devices, and they have more chance to reach valuable information for investments.

Highly educated and married individuals may be more selective during making an investment. However, in this research, it was found that education and marital status differences were insignificant ( $p>0.05$ ). There may be several reasons for this result, but the fact that marital status and education levels of participants were similar, and the research was single-centered.

Making an investment requires income, and income is related with expenses. The first condition of giving an investment decision is having income more than expenses (Gilboa, 2010; Loibl and Hira, 2009; Bechara, 2004; Baker and Nofsinger, 2002). Thus, it may be argued that having more income level increases investment opportunities. In this research, it was found that high income participants were more keen to invest crypto currency with statistically significant difference ( $p<0.05$ ). This

finding was in accordance with literature results, and showed that having more income means more investment on financial values such as crypto coin.

After high income or an income level more than expenses, one of the most important issues for giving an investment decision is confidence. Confidence may be seen a trigger for the investment decision. In literature, there have been many researches on the relationship between confidence and investment decision (Obamuyi, 2013; Tseng, 2012). These studies conclude that having confidence increases investment rates, but high confidence may cause behavioral bias (Rana et al, 2014). In this research, it was found that participants who had higher confidence level were keen to invest crypto currency with statistically significant difference ( $p<0.05$ ). This result was in accordance with literature results.

Another important issue for giving an investment decision is risk. In literature, risk perception is directly related with investment decisions. Similar to confidence, risk is also a serious behavioral bias source. In this research, it was found that participants who had higher risk level were keen to invest crypto currency with statistically significant difference ( $p<0.05$ ). This result was also in accordance with literature results.

Giving an investment decision is related with financial knowledge. Increasing financial knowledge, reaching financial information, and reading them is related with financial literacy. In literature, financial literacy is reported to be one of the most important factors to give a right investment decision. In this research, it was found that financial literacy score of crypto currency investors were higher than non-investors, but differences between groups were statistically insignificant ( $p>0.05$ ). The main reason for this result may be the fact that sample of the research was banking sector workers, and their financial literacy level were higher than other working areas. Results may change on different and multi centered samples.

Although not directly related with investment decisions, digital literacy may be correlated with crypto currency. Crypto currency is a new media far from other conventional investments. In this respect, reading digital data and interpreting them efficiently may be important to give a right investment decision. In this research, it was found that digital literacy score of crypto currency investors were higher than

non-investors, and the difference was significant ( $p<0.05$ ). The main reason for this result may be the fact that making a digital media investment must be related with reading digital media concept.

The difference analysis results between gender, confidence, risk and digital literacy were significant, and their correlation results were also significant. It was found that there were significant and positive correlations between crypto coin investing and gender ( $0.288$ ;  $p<0.01$ ), confidence ( $r=0.290$ ;  $p<0.01$ ), risk ( $r=0.332$ ;  $p<0.01$ ) and digital literacy ( $r=0.216$ ;  $p<0.01$ ). It was found that there was significant and negative correlations between crypto coin investing and education ( $r=-0.097$ ;  $p<0.05$ ). According to correlation coefficient, the most related factor affecting crypto currency was risk, followed by confidence gender and digital literacy.

According to multivariate analysis, it was found that gender, being master/PhD graduated, confidence, very low risk and digital currency had significant effect on crypto coin investment ( $p<0.05$ ). Multivariate analysis results showed that effect of gender on crypto currency decision was insignificant, although it was significant at univariate level.

## 6. CONCLUSION

According to the results obtained in the research, although the digital literacy and financial literacy levels of those who invest in crypto money are high in general, digital literacy has a significant effect on the investment decision. It is possible to state that the fact that the research sample is bankers and that the bankers have a high level of financial literacy has an effect on these results. In addition to this, it should be stated that the significant ones among the demographic characteristics are the effect of both the research sample and the male-dominated structure regarding investment in our country.

Results of the study may be concluded as follows:

- Males more invest crypto currency than females with statistically significant difference ( $p<0.05$ ).
- Age distribution of crypto currency investors were lower, showing that young participants invest crypto currency with statistically significant difference ( $p<0.05$ ).
- Education and marital status differences were insignificant ( $p>0.05$ ).
- High income participants were more keen to invest crypto currency with statistically significant difference ( $p<0.05$ ).
- Participants who had higher confidence level were keen to invest crypto currency with statistically significant difference ( $p<0.05$ ).
- Participants who had higher risk level were keen to invest crypto currency with statistically significant difference ( $p<0.05$ ).
- Financial literacy score of crypto currency investors were higher than non-investors, but differences between groups were statistically insignificant ( $p>0.05$ ).
- Digital literacy score of crypto currency investors were higher than non-investors, and the difference was significant ( $p<0.05$ ).
- There were significant and positive correlations between crypto coin investing and gender, confidence ( $r=0.290$ ;  $p<0.01$ ), risk ( $r=0.332$ ;  $p<0.01$ ) and digital literacy ( $r=0.216$ ;  $p<0.01$ ).
- There was significant and negative correlations between crypto coin investing and education ( $r=-0.097$ ;  $p<0.05$ ).

- Gender, being master/PhD graduated, confidence, very low risk and digital currency had significant effect on crypto coin investment ( $p<0.05$ ).
- The effect of financial literacy was statistically insignificant ( $p>0.05$ ).

Another important result of the research is that when the effects of demographic factors, digital literacy and financial literacy concepts in crypto investments are evaluated in general, it is seen that they have a similar structure to other investment types. In other words, the investment decision-making process in crypto money is similar to the decision-making processes in other investment types. Although there are discussions on some concepts regarding crypto money investment in the literature, it is seen that investors intellectually accept crypto money as an investment tool.

Although behavioral bias is of vital importance in making financial decisions, more comprehensive, budgeted and timely studies are needed to measure them. In this study, the concepts of trust and risk perception were examined, which will serve as a basis for future studies on behavioral misconception. Conducting studies on behavioral misconceptions in further research can provide important contributions to the field.

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## APPENDICES

### Appendice 1. Survey Form

Değerli katılımcı,

Bu anket çalışması, makroekonomik göstergeler ve davranış hatalarının kripto para yatırımı üzerindeki etkilerini incelemek için yapılan yüksek lisans tezinde kullanılmak üzere yapılmıştır. Sizden isteğimiz, sorulara mümkün olduğunca içten ve tutarlı yanıt vermenizdir. Bilimsel çalışmamıza vermiş olduğunuz katkı için teşekkür ederim.

#### A. DEMOGRAFİK ÖZELLİKLER

1. Cinsiyet

Kadın  Erkek

2. Yaş

25 ve altı  26-35 arası  36-45 arası  46 ve üzeri

3. Eğitim durumu

İlköğretim  Lise  Lisans  Lisansüstü

4. Aylık gelir grubu

Düşük  Orta  Yüksek

5. Medeni durum

Evli  Bekar

#### B. RİSK ALMA DURUMU VE YATIRIM KARARI

6. Yatırım yaparken kendime güven düzeyim

Çok düşük  Düşük  Orta  Yüksek  Çok yüksek

7. Yatırım yaparken risk alma düzeyim

Çok düşük  Düşük  Orta  Yüksek  Çok yüksek

8. Kripto para yatırımı yapar mısınız?

Evet  Hayır

9. Kripto para yatırımı yapıyor iseniz, altcoin alır mısınız?

Evet  Hayır

#### C. FİNANSAL OKURYAZARLIK

Aşağıdaki maddeler, sizin finansal okuryazarlık düzeyinizi tespit etmek için önerilmiştir. İlgili önermelere katılma derecenizi Kesinlikle katılmıyorum=1 ve Kesinlikle katılıyorum=5 olacak şekilde yanıtlayınız.

No	MADDELER	1	2	3	4	5
1	Türkiye'de emeklilik yaşı herkes için sabit olup, 65'tir.					
2	En yüksek faiz oranına sahip olan kredi türü, Tüketiciler (ihtiyaç) kredisidir.					
3	Finansal terimleri karmaşık bulurum.					
4	Kredi kartımın aylık faiz oranını biliyorum.					
5	ATM kartına sahip olmak için banka hesabının olması gereklidir.					
6	Enflasyon, hayat pahalılığının neden olduğu bir durum.					
7	Paranın getiri sağlama için vadeli hesap olmalıdır.					
8	Finans dilini anlayabilme yeteneğim zayıftır.					
9	Kredi kartımın sadece asgari tutarını öderim.					
10	Finansal konularda karar vermeden önce finansal bilgi edinmek için çok çaba göstermem.					

#### D. DİJİTAL OKURYAZARLIK

Aşağıdaki maddeler, sizin dijital okuryazarlık düzeyinizi tespit etmek için önerilmiştir. İlgili önermelere katılma derecenizi Kesinlikle katılmıyorum=1 ve Kesinlikle katılıyorum=5 olacak şekilde yanıtlayınız.

No	MADDELER	1	2	3	4	5
1	Kullandığım teknolojilerle ilgili karşılaştığım teknik problemleri nasıl çözeceğimi bilirim.					
2	Yeni teknolojileri kolayca öğrenebilirim.					
3	Önemli yeni teknolojileri takip ederim.					
4	Birçok farklı teknoloji hakkında bilgi sahibiyim.					
5	Bilgi ve iletişim teknolojilerini öğrenme amaçlı kullanma konusunda ve öğretmelerimi sergileyebileceğim dijital öğretim materyallerini (Örneğin: Sunumlar, dijital hikayeler, wikiler, bloglar) geliştirmek için gereken teknik becerilere sahibim.					
6	Bilgi ve iletişim teknolojileri konusunda sahip olduğum beceriler yeterlidir.					
7	İnternetten bilgi edinmek için yaptığım arama ve değerlendirmelerde kendime güvenirim.					
8	Siber güvenlik, webde arama ve internette sahtecilik vb. internet etkinlikleri ile ilgili konulara aşınayım.					
9	Bilgi ve iletişim teknolojileri, bir projede çalışma ve diğer öğrenme etkinlikleri konusunda akranlarımla daha iyi işbirliği yapmamı sağlar.					
10	Üniversitedeki çalışmalarımda, arkadaşlarımla internet üzerinden (ör. Skype, Facebook, Bloglar aracılığıyla) sık sık yardımşim.					

## **ETHICS BOARD APPROVAL**

Ethics Board Approval is available in the printed version of this dissertation.

