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| RESEARCH ARTICLE

The Investor Behaviour, Risk Perception and Expectations on Cryptocurrency Markets

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| ABSTRACT
The financial sector, which has sparked increasing organizational and scientific interest in recent years, plays a vital role in the Turkish economy. After enduring multiple economic downturns, consumers have become more cautious when considering financial investments, making it challenging for financial institutions to formulate effective marketing strategies. This study aims to shed light on investor behavior in Tukish markets. The results of two surveys are examined: the first conducted in the final quarter of 2022, and the second in the first quarter of 2023. This article delves into various variables, including stress levels, portfolio holding times, investment choices, and attention to cryptocurrency markets. The methodology employs the Mann-Whitney U test, Cronbach's Alpha, Kolmogorov-Smirnov, and Shapiro-Wilk normality tests. The findings from the two surveys are compared. Based on the analysis results, it can be inferred that respondents' investment preferences and risk tolerance have evolved over time. The results demonstrate a spectrum of portfolio diversification tendencies.

| KEYWORDS
Investor behavior, risk perception, cryptocurrency market, Bitcoin, Mann-Whitney U test.

JEL Codes: G1, G4, C4

| ARTICLE INFORMATION

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1. Introduction

There are various factors that effect investor decision-making, such as social, economic, and political aspects. For instance, associated with the COVID-19 pandemic, the financial and monetary policies of Central Banks (CBs) changed. Most of them provided substantial liquidity to alleviate the tightening of financial difficulties. The sharp decrease in interest rates, supply chain problems, and the subsequent Ukraine-Russia war, along with fluctuations in oil prices and other financial instruments, created challenges both in managing the economy and making financial decisions. All of these factors triggered an increase in inflation, which demonstrated the complexity of the financial markets.

There is a wide range of investment instruments available on the market today, each with a different relative value to a company. One of the most crucial ways to determine an investor's future well-being is through income-generating investments. However, capital gain not always realized due to the inherent risk. Bikas & Glinskyte (2021) indicate that choosing and developing a successful investment strategy represents the biggest barrier for investors. The primary determinants of investment decisions can be explained by factors such as security, rate of return, expected capital growth, and current and expected levels of market risk. Furthermore, Shaik et al. (2022) state the numerous investment possibilities with various risk-reward trade-offs.

According to several studies (Ledgerwood, Earne, & Nelson, 2013), the variety of financial products and services available in the financial market has made it more complex and challenging for individual investors to make rational investment decisions, leading to irrational behavior among investors. Today's consumers must manage their finances more than ever because of the unpredictable nature of financial products available on the market. The related literature highlights that various factors affect the

decision-making of investors, not only limited to current situations but also future expectations. For emerging economies, the criteria are not only limited to their macroeconomic environment but also the policies of major central banks (CBs) are widely followed.

In this research, we aim to figure out if there is a difference in investor behavior in Turkish markets. A questionnaire is implemented for two consecutive years, 2022 and 2023, to assess how investment triggers have changed. The sample sizes of the surveys are 288 and 250, respectively, and all respondents are individual investors. The aim of the study is to ascertain whether investors make diverse investment selections. The normality and Mann-Whitney U tests are utilized to demonstrate the discrepancies in investments between the two surveys.

2. Literature Review

Various factors affect investor behavior in both macro and micro aspects. The related literature highlights different research focusing on various indicators. For instance, Gedajlovic et al. (2005) explain how investment behavior and financial performance are influenced by the ownership structure. They use data from 1996 to 1998, covering 247 Japanese manufacturers. Japanese shareholders are categorized into six groups: foreign investors, investment funds, pension funds, banks and insurance companies, affiliated companies, and insiders. Their findings support a strong relationship between the equity stakes of a specific category of investor and a firm's financial performance, showing that investment behavior is considerably more complex than what simple principal-agent representations depict. Apolinario et al. (2006) implements GARCH and T-ARCH models to analyze the day of the week effect on European stock exchange markets. The results support that abnormal behavior is not present.

Waweru et al. (2008) examined the relation between behavioural finance and investor psychology for the Nairobi Stock Exchange. The analysis includes 23 corporate investors, and the outputs state that these investors' decisions are effected by behavioural factors such as representativeness, overconfidence, anchoring, gambler's fallacy, availability bias, loss aversion, regret aversion and mental accounting. Another study for the Nairobi Stock Exchange is established by Mutswenje (2009) was to establish the factors influencing investment decisions. 42 individual investors were asked a structured questionnaire, and Friedman's test and factor analysis was implemented to the data. The empirical findings highlight that factors such as reputation, market share, expected income level, past market performance, macroexpectations and the dividend policy play a role in investor decisions. Biais et al. (2005) aims to measure the degree of overconfidence of 245 participants and observe their investment behaviour under asymmetric information. Their findings support that miscalibrated traders who underestimate the uncertainty about the financial instrument's value are expected to be especially vulnerable to the winner's curse. High self-monitor investors are expected to behave strategically and achieve a better rate of return. Its empirical results show that miscalibration reduces and self-monitoring effects trading performance.

Kumar & Goyal (2015) makes a literature review on behavioural biases in investor decisions for the past 33 years. They sort 117 selected articles published between 1980 and 2013. The related literature especially highlights the lack of related publications for emerging markets. Furthermore, they indicate the lack of empirical research on individuals who exhibit herd behaviour, the focus on equity in home bias, and indecisive empirical findings on herding bias. Altman (2012) focuses on different methodologies of financial literacy, related institutional change, and public policy. The research indicates the institutional and environment constraints that effects the financial decisions of individuals. The paper suggests that financial decision making can be supported by a type of better quality and understandable information, and an education on financial literacy may help.

Wang et al. (2022) determine the investor decisions on financial markets during COVID-19 for UK markets. This quantitative study examines the results using a survey in a non-probability sampling is implemented for a sample of 337 respondents. The SEM technique has been adopted the analysis determined significant moderation of COVID-19 uncertainty over the relationship of risk perception and general risk to tolerance. Zhu & Xiao (2020) examines the relation between financial literacy and investment decisions in risky securities using the outputs of the China Household Finance Survey and exploring its mediators using Probit regressions. According to their results, financial literacy is positively correlated with holding risky assets.

In Sonkurt & Altınöz's (2021) study they examine the investment behavior and trading frequency of cryptocurrency investors. Their aim is to understand gambling disorders and the relationship between cryptocurrency investment behavior and impulsivity using a survey with a sample of 300 respondents. Their findings support that the rate of pathological traders in the sample was 48.7%. Furthermore, impulsivity was higher in the 18-25 age group. High-frequency traders were more likely to exhibit pathological behavior, and their impulsivity was also higher.

3. Methodology

The aim of this study is to provide insights into how investors behave and perceive risk in Turkish financial markets. The outcomes of two surveys conducted in the most recent two consecutive quarters are examined and compared. The surveys are divided into three sections. The first part includes demographic questions. The second part comprises inquiries about financial literacy, investment behavior, and factors contributing to financial stress. The final section analyzes perceptions of the cryptocurrency market.

In this study, the Mann-Whitney U test, Cronbach Alpha test, normality test, and graphical analysis are all conducted. The results of the selected questions are first graphically illustrated to demonstrate the correlations and discrepancies between the quarterly-based surveys. Following this, the Cronbach Alpha test is implemented to test reliability, followed by the Kolmogorov-Smirnov and Shapiro-Wilk tests. The Mann-Whitney U and Wilcoxon W tests are also applied, and finally, the findings from the two surveys are compared.

Roughly 58% of the respondents in each survey are male, while 42% are female. According to demographic statistics, approximately half of the respondents fall in the middle-aged category, between the ages of 36 and 50. Young respondents, those aged between 18 and 25, make up only 2.4% of the first survey's respondents and 8.8% of the second survey's. In both surveys, about half of the respondents hold a graduate degree. Only 1% (in the first survey) and 8% (in the second survey) of respondents have worked for less than a year, compared to more than 40% (in the first survey) and 30% (in the second survey) of respondents who have worked for more than 20 years. In other words, the survey was conducted among a large group of seasoned investors who were of legal drinking age. The Cronbach alpha coefficient tests the reliability of a set of questions. Therefore, usually the initial step is to check this coefficient. It will also influence whether the coefficient of reliability to be estimated for the question will turn out to be low or high whether the group of people treated to the inquiry is homogeneous or heterogeneous with respect to the characteristic examined. The Cronbach alpha is measured as 0.702 for the first survey and 0.701 for the second one, which ensures the consistency of the questionnaire. The Cronbach alpha coefficient tests the reliability of a set of questions. Therefore, usually the initial step is to check this coefficient. It will also influence whether the coefficient of reliability to be estimated for the question will turn out to be low or high whether the group of people treated to the inquiry is homogeneous or heterogeneous with respect to the characteristic examined. In other words, the Cronbach Alpha score is used to gauge the scale's reliability in assessing respondents' investment choices. When the Cronbach Alpha score is more than 0.60, it is possible to conclude from these results that the question construct is reliable (Ghazali, 2016). After reliability is tested with Cronbach Alpha, it is determined whether a sample mean differs significantly from the population mean. In other words, the Kolmogorov-Smirnov Test can be used as a normality test to determine whether the tested values have a normal distribution.

The Kolmogorov-Smirnov test was first proposed by Kolmogorov (1933a, 1933b), and it was later improved by Smirnov (1939a, 1939b). A definition of the test statistic is as follows:

$$D = |F_0(X) - S_n(X)| \quad (1)$$

Where $S_n(X)$ is the observed frequency of the variable *X* from the sample and $F_0(X)$ is the function of the random variable *X* (anticipated). If the resulting *D* statistic is substantial, the assumption that the sample is drawn from a population with a regularly distributed population is rejected.

On the statistic, the Shapiro-Wilk test (1965) is built:

$$W = \frac{(\sum_{i=1}^{n} \alpha_i X_{(i)})^2}{\sum_{i=1}^{n} (X_i - \bar{X})^2} \quad (2)$$

Where the ordered sample values are, $X_{(1)} \leq X_{(2)} \leq ... \leq X_{(n)}$ and the tabular constants are α_i. Normality is rejected for low *W* values. The *W* test has been acknowledged as being particularly effective for the hypothesis that *X*, a random variable, is normally distributed with an unknown mean μ and variance σ^2. The Shapiro-Wilk test was updated by Royston (1982) to impose a limitation on the sample size of 2000, and algorithm AS181 was then proposed. Later, Royston (1992) pointed out that Shapiro-Wilk's (1965) approximation for the algorithmic weights was inadequate when n is greater than 50.

4. Findings

Initially, the Cronbach Alpha Coefficient (Cronbach's alpha) is calculated and found to be greater than 0.60. Next, the Kolmogorov-Smirnov and Shapiro-Wilk tests are applied to assess normality. The test statistics for both tests approach zero, as indicated by the data processing results. A significance level of less than 0.05 highlights a non-normal distribution. Consequently, a non-parametric

test called the Mann-Whitney U test is employed to discern the differences between the groups. Table 1 below presents the demographic data from two surveys representing Q4 of 2022 and Q1 of 2023.

Table 1. Demographic Characteristics

2022 Q4													
Age category				**Education**				**Business Experience**					
18-25	**26-35**	**36-50**	**>50**	**High school**	**Undergraduate**	**Graduate**	**Ph.D**	**<1 year**	**1-5 years**	**6-10 years**	**11-15 years**	**16-20 years**	**>20 years**
2%	26%	48%	24%	0%	15%	35%	50%	0%	12%	12%	18%	18%	40%
2023 Q1													
Age category				**Education**				**Business Experience**					
18-25	**26-35**	**36-50**	**>50**	**High school**	**Undergraduate**	**Graduate**	**Ph.D**	**<1 year**	**1-5 years**	**6-10 years**	**11-15 years**	**16-20 years**	**>20 years**
9%	39%	37%	15%	0%	33%	37%	30%	7%	18%	18%	18%	10%	29%

Table 1 indicates that according to the survey results, approximately 75% of the participants in both surveys are between the ages of 26 and 50. Half of the investors who attended the first survey have a doctorate degree. Furthermore, 76% of the participants in the first survey and 57% of the participants in the second survey have 10 years or more of work experience.

Table 2. Mann-Whitney U test result

Question/Variable	**Survey**	Mean Rank	Asym. Sig. (2-tailed)
Holding time for the portfolio.	2022 Q4	137.56	0.02**
	2023 Q1	161.26	
Percentage of monthly income that is invested in financial markets.	2022 Q4	135.08	0.03**
	2023 Q1	157.12	
Ever invested in cryptocurrencies?	2022 Q4	168.73	0.01**
	2023 Q1	142.22	
How often do you control your investments?	2022 Q4	126.87	0.00***
	2023 Q1	160.73	
The thought of losing money stresses me out.	2022 Q4	112.09	0.00***
	2023 Q1	151.13	
I have sufficient knowledge and confidence in creating and managing a portfolio.	2022 Q4	119.73	0.00***
	2023 Q1	168.26	

*,**,*** shows the variable is statistically significant at 10%, 5% and 1% significance level, respectively.

Table 2 exhibits the Mann-Whitney Test results. The outputs indicate the following:

- Investors in the second survey hold their portfolios longer than those in the first survey.
- Participants in the second survey make financial investments with a larger portion of their monthly income.
- Participants in the first survey invested more in cryptocurrencies than the investors in the second survey.
- Investors in the second survey check their investments more often.
- Respondents in the second survey experience more stress than those in the first survey due to their investment preferences.
- Respondents in the second survey feel more confident in creating and managing portfolios.

In the next set of questions, investors were asked about their risk perceptions regarding cryptocurrencies and were required to list the financial assets they would include in their portfolios if they were to invest today. The output is exhibited in table 3 below.

Table 3. Cryptocurrency Risk Perception and Portfolio Rankings

	If you were to create a portfolio today, what would you primarily invest in?	Do you think there will be another crypto currency that will take the lead of Bitcoin in the market?	Do you expect a collapse in crypto markets?
2022Q4	1. Foreign Currency & Eurobond 2. Stocks 3. Gold 4. Real estate 5. Government Securities 6. Mutual Funds 7. Cryptocurrency 8. Under the pillow	Yes: %35	Yes: %46
		No: %24	No: %17
2023 Q1	1. Foreign Currency & Eurobond 2. Stocks 3. Real estate 4. Gold 5. Mutual Funds 6. Government Securities 7. Cryptocurrrency 8. Under the pillow	Yes: %32	Yes: %45
		No: %36	No: %34

5. Conclusion

This research aims to understand how investor behavior, risk perception, and market expectations regarding cryptocurrencies vary among different investors. The findings reveal both similarities and disparities among several parameters. For example, the "holding period" is defined as the duration an investor retains an investment or the period between purchase and sale. The holding period is influenced by investors' risk aversion and financial literacy. Riskier assets compel investors to proactively adjust their buying and selling actions. The study's results indicate that investors in the middle-aged demographic tend to hold their portfolios for longer periods.

According to the second survey, investors demonstrate a greater willingness to invest a portion of their monthly income in financial markets. The results also indicate that more knowledgeable and experienced investors are more inclined to invest in Bitcoin markets. Investors in the second survey express a higher level of comfort when managing their portfolios, even though they do so more frequently. In contrast to investors in the first survey, they experience more stress due to potential financial losses resulting from their investment decisions. Despite both groups anticipating a cryptocurrency market downturn, investors in the first survey anticipate a different cryptocurrency overtaking Bitcoin as the market leader.

The results shed light on various portfolio diversification behaviors. While some highly educated and experienced investors prefer to invest in gold, others initially choose this option.

Perhaps the empirical outputs may vary due to the country in that the research is implemented. Furthermore, there may be differences based on emerging markets and the developed economies since even the Central Banks' monetary policies may be distinct. The major limitation regarding this study is the comparative analysis of the perceptions of investors from different economies. To gather such a data will highlight a more concise framework for understanding the financial markets and investor behaviour. We highly recommend future research to enlarge this idea of research to conduct the survey in different countries.

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