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ASSOC. PROF. DR. UMUT TOLGA GÜMÜŞ

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Contents

Chapter 1

RESEARCH ON THE EFFECT OF PSYCHOLOGICAL FACTORS OF INDIVIDUAL INVESTORS ON THEIR FINANCIAL BEHAVIORS[1]

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INTRODUCTION

Nowadays, it is seen that the number of studies investigating the effects of individuals' psychological states on their investment decisions has gradually increased among individual-focused studies conducted within the scope of the behavioral finance discipline. Studies addressing the effects of individuals' psychological mistakes on investment decisions focus on the psychological factors that mislead individuals and the effects of these factors on investment decisions.

Considering the main factors affecting financial decisions and financial investment decisions, personal factors, environmental factors, and individuals' risk attitudes come to the forefront. Personal factors consist of an individual's gender, age, knowledge level, health status, profession, and income level. Individuals' immediate surroundings, families, cultural environments, social environments, and other close groups that individuals refer to in their decisions constitute environmental factors. Individuals' risk attitudes comprise their risk selection approaches and their expectations against risk.

Another factor that affects financial decisions and is included in the discipline of behavioral finance is individuals' psychological attitudes. These attitudes consist of over-confidence behavior, excessive optimism behavior, excessive pessimism behavior, herd behavior, and psychology of risk (Daniel et al., 2001).

In this respect, the first section of the study discussed and explained the concept of behavioral finance to establish the conceptual basis for the study to be conducted. Furthermore, the theories and models presented in the literature were explained in the first section, and the theoretical framework of the study was established. In the continuation of this section, the role of psychological attitudes affecting individuals within the discipline of behavioral finance was also investigated. At the end of the section, the financial and economic factors affecting individuals' financial decisions were explained, and the literature examining the relationships between the variables accepted within the scope of the study was reviewed.

In the second section of the study, the aim, scope, hypotheses, limitations, and sample area of the study conducted to examine the effects of psychological factors affecting individual investor behaviors on financial decisions and financial behaviors are presented.

In the third section of the study, the results obtained from hypothesis tests were presented, and these results were supported by comparing them with other studies in the literature.

In the results and recommendations section of the study, inferences regarding the results obtained within the study's scope were explained, and recommendations were developed to contribute to the literature. Furthermore, the results were discussed by comparing them with the results obtained in the literature. Finally, research subjects for other researchers were proposed.

1. CONCEPTUAL FRAMEWORK

1.1. Behavioral Finance

Numerous theories and models were developed with different perspectives in the historical process with the consideration of financial activities within the field of scientific research. Financial theories, which were discussed with different approaches in different periods, differed over time and led the application areas. The most fundamental difference that the finance discipline has revealed over time is the way it addresses the human factor. While the traditional finance approach addressed the human factor as a "rational" entity, studies adopting the behavioral finance approach accepted that the human factor might also exhibit "irrational" behaviors (Sansar, 2016:136).

To briefly mention the theories related to behavioral finance, the prospect theory developed by Kahneman and Tversky is the most important of them. The starting point of the theory is to determine people's decision-making styles in cases where risk is high and uncertainty prevails. The prospect theory, which emerged as an alternative to the expected utility theory with the findings obtained, was published in 1979 under the name "*Prospect Theory: An Analysis of Decisions Under Risk*."

According to Daniel, Hirshleifer, and Subrahmanyam's model, people are affected by many factors while making investment decisions. These factors originate from both personal and environmental characteristics. Bolhuis and Goodman (2005:62) state that investors are affected by some factors, such as benefiting from past experiences, avoiding losses, and over-confidence, while making investment decisions, and they act in line with these effects. Daniel et al. (1998) focused on the psychological factors by which investors were affected while making investment decisions and indicated that two basic emotions, over-confidence and self-attribution, emerged.

Investors consider themselves superior in their investment behavior to increase the value of their assets and fall into the mistake of *over-confidence* while making investment decisions. Another misconception that leads investors to make wrong investment decisions is the fallacy of *self-attribution*. Investors are affected by the investment success they

achieved in the past and highlight their own success while making investment decisions. Investors who implement investment behaviors in this context reinforce these feelings if their investment decisions are successful. If their investment decisions fail, they deceive themselves by attributing it to chance (Daniel et al. 1998:1844).

These two psychological states affecting investors are based on the misinterpretation of the actual information shared with the market about investment instruments. These two basic psychological emotions, which lead to the neglect of actual information, mislead investors and cause them to make wrong investment decisions (Daniel et al. 1998:1865).

Unlike other models, Hong and Stein's model attempts to determine how investors exhibit investment behaviors and explain the types of investor behaviors in line with these results rather than questioning the resulting irrational behaviors based on psychological foundations.

Hong and Stein (1999:2143) divide investor behavior types into two. The first is *News Hunters,* who determine investment behavior in accordance with the developments in the market and the information obtained. The second one is *Momentum Investors,* who consider the investment trends of investment instruments in previous periods and act according to the changing status of the investment instrument in a certain period. Here, while news hunters are the type of investors who act by considering future expectations, momentum investors are the type of investors who act based on previous data (Hong and Stein, 1999:2143).

1.2. Psychological Attitudes Affecting Individual Investor Behaviors

In behavioral finance studies that have developed in response to considering people as rational, the primary goal is to prove that individuals cannot make rational decisions in uncertain environments and when at risk (Kahneman and Mark, 1998:2). Psychological and sociological factors are the factors that affect people's rational decision-making behaviors. Revealing and discussing the factors that affect people's rational decision-making behaviors and the situations that cause these factors to occur is among the areas of interest of the behavioral finance discipline.

The factors affecting people's decision-making behaviors are classified in different ways in the literature. Daniel, Hirshleifer, and Subrahmanyam (2001) discuss the reasons that make human behavior irrational and are called anomalies in four groups. These anomalies are as follows:

1. Cognitive anomalies include psychologically based anomalies of individuals. These anomalies intellectually affect individuals and impact their decision-making abilities.

2. Intuitive anomalies are anomalies based on an individual's previous experiences and inferences. They cause individuals to act based on experience in the financial decision-making process.

3. Emotional anomalies are anomalies based on individuals' emotional states. These anomalies affect individuals' financial decisions based on changes in their emotional states.

4. Social interaction anomalies are the reflection of the experiences and inferences experienced by people around the individual on the individual. They occur when individuals in social communication influence each other.

Since the psychological factors discussed in the present study overlap with cognitive anomalies, the anomalies of over-confidence, excessive optimism, excessive pessimism, herd behavior, and psychology of risk that constitute cognitive anomalies are explained respectively (Pompian, 2006:51).

2. Method

2.1. Aim of the Study

The aim of the study was to determine the effect of psychological factors on the financial behaviors of individual investors. In this regard, it was aimed to investigate the effects of investors' cognitive anomalies in their financial decision-making processes on decision-making processes and the importance of psychological factors in financial decisions. The main question of the study designated within the framework of the main purpose was determined as follows;

"Do individual investors' psychological attitudes affect their financial behaviors?" In other words, "Do psychological factors affect investors' financial behaviors?" Within the framework of this main question, the following sub-questions were determined:

- Does over-confidence behavior affect investors' financial behaviors?
- Does excessive optimism behavior affect investors' financial behaviors?
- Does herd behavior affect investors' financial behaviors?
- Does psychology of risk affect investors' financial behaviors?
- Does excessive pessimism affect investors' financial behaviors?

2.2. Scope of the Study

Individuals with a monthly income of 4500 TL and above who saved and used their savings as investments constituted this study's scope. The prepared survey questions were asked to people aged 18 and above who met these conditions, and their answers were obtained.

2.3. Assumptions of the Study

The main assumption in the study was that the individuals who participated in the survey answered the questions sincerely and accurately. Nevertheless, the fact that the selected sample represented the population was also among the assumptions.

2.4. Population and Sample of the Study

Individuals who were citizens of the Republic of Turkey, were aged 18 and over, had a monthly income of at least 4500 TL, and had the potential to invest constituted the study's population.

Based on the data from TurkStat, the number of people living in Turkey and included in this study was determined to be approximately 60 million people as of 2020.

2.5. Data Collection Tools of the Study

A questionnaire consisting of 19 statements to determine the participants' demographic characteristics and investment preferences and the scales to measure investors' financial behaviors and investors' psychological factors were used in this study.

A Likert scale prepared by Ton and Dao (2014) and consisting of a total of 17 statements, including over-confidence (3 statements), excessive optimism (4 statements), herd behavior (4 statements), psychology of risk (4 statements), and excessive pessimism (2 statements), was used to measure the psychological factors of individual investors.

A scale prepared by Dew and Xiao (2011) and comprising 11 statements was used to measure individuals' financial behaviors.

Moreover, the question "Have you made financial savings as a family in the last 12 months?", which was prepared by Renneboog and Spaenjers (2012) and included in the scale, concerning individuals' financial decisions was also included in the questionnaire. Thus, the questionnaire contained a total of 43 questions and statements, including demographic questions.

2.6. Hypotheses of the Study

In his study, Ülkü (2001) discussed whether the overreaction psychological attitude existed in the ISE (Istanbul Stock Exchange).

The study determined that the overreaction psychological attitude was observed in individual investors and that sudden situations in markets and the latest situations of stocks significantly affected individuals' investment behaviors.

In the study by Dorukan (2004), which addressed the question of whether overreaction was among the psychological attitudes of individual investors in the ISE, the overreaction attitudes of individual investors were examined using data between 1998 and 2003. The study concluded that there was an overreaction psychological attitude in the ISE.

The study by Altay (2007) investigated the herd behavior attitude, one of the psychological attitudes of individuals, and the effect of this attitude on individuals' financial behaviors. The study found that in cases of general declines or general rises in the ISE market, individual investors acted toward this general trend and preferred to act jointly with other investors under the influence of herd psychology.

In his study, Sezer (2013) discussed the relationship between individual investors' cognitive abilities, risk preferences, and financial literacy levels and determined that individuals' psychological attitudes played an active role in their financial decisions. Furthermore, it was concluded that there was a significant relationship between the level of financial literacy and cognitive abilities, that individuals with a high level of financial literacy made financial decisions based on their cognitive abilities, and that individual investors with a low level of financial literacy were more affected by psychological attitudes.

The study by Göksu (2013), which aimed to determine the extent to which individual investors' risk avoidance behaviors and portfolio diversification behaviors were affected by cognitive and emotional tendencies, concluded that although individuals had the intention to avoid risk while making investments, they could not do it due to their cognitive and emotional tendencies.

Based on the literature, the hypotheses tested in the study are as follows;

H1: Psychological factors of individual investors affect their financial behaviors.

$H1_a$: 'Over-confidence,' one of the psychological factors of individual investors, affects the financial behaviors of investors.

$H1_b$: 'Excessive optimism,' one of the psychological factors of individual investors, affects the financial behaviors of investors.

$H1_c$: 'Herd behavior,' one of the psychological factors of individual

investors, affects the financial behaviors of investors.

$H1_d$: 'Psychology of risk,' one of the psychological factors of individual investors, affects the financial behaviors of investors.

$H1_e$: 'Excessive pessimism,' one of the psychological factors of individual investors, affects the financial behaviors of investors.

3. RESULTS AND DISCUSSION

3.1. Investigation of the Compliance of Data with Normal Distribution

The data obtained from the participants were analyzed with the SPSS program and studied at a confidence level of 95%. The fact that the kurtosis and skewness values acquired from the intra-item scales were between -3 and +3 is considered sufficient for the normal distribution (De Carlo, 1997). According to another view, the fact that these coefficients are between -2 and +2 is considered sufficient for the condition of normal distribution of data (Şencan, 2002, p. 459). The said conditions were met in the present study.

Table 1: *Descriptive Statistics and Normality Test of the Financial Behavior Scale*

Dimensions	n	Mean	sd	Skewness	Kurtosis
Financial Behavior General	401	3.90	0.669	-0.440	-0.686
Cash Flow Management (CFM)	401	4.08	0.765	-0.667	-0.194
Credit Management (CM)	401	4.16	0.879	-0.794	-0.377
Savings and Investments (S&I)	401	3.39	1.135	-0.409	-0.735

Table 2: *Descriptive Statistics and Normality Test of the Psychological Factors Scale*

Dimensions	n	Mean	sd	Skewness	Kurtosis
Psychological Factors General	401	2.61	0.992	0.217	-0.608
Over-Confidence	401	2.81	1.076	0.246	-0.585
Excessive Optimism	401	2.35	1.246	0.502	-0.861
Herd Behavior	401	2.51	1.042	0.293	-0.610
Psychology of Risk	401	2.77	1.206	-0.095	-1.035
Excessive Pessimism	401	2.68	1.148	-0.059	-0.769

As seen in Table 18, both the general form and the five sub-dimensions of the Psychological Factors Scale met the conditions of normal distribution. Hence parametric tests can be used in analysis.

3.2. Reliability Analysis Results of the Data Collection Tool

Cronbach's alpha coefficient was employed to determine the reliability level of the scales used in the study. Cronbach's alpha coefficient provides the scale's reliability level. The coefficient varies between 0 and 1. Depending on the alpha (α) coefficient, the reliability of the scale is interpreted as follows (Akgül and Çevik, 2005: 435-436);

- If $0.00 \leq \alpha < 0.40$, the scale is unreliable,
- If $0.40 \leq \alpha < 0.60$, the reliability of the scale is low,
- If $0.60 \leq \alpha < 0.80$, the scale is quite reliable,
- If $0.80 \leq \alpha < 1.00$, the scale is highly reliable.

The statement "I make a comparison when purchasing a product or service" of the Financial Behavior Scale was removed from the analysis since it negatively affected the scale's reliability, so the number of statements in the Financial Behavior Scale, which was 11, was reduced to 10.

Table 3: *Reliability Coefficients of the Financial Behavior and Psychological Factors Scales*

Dimensions	Number of Items	Cronbach's Alpha
Financial Behavior General	10	0.770
Cash Flow Management (CFM)	3	0.539
Credit Management (CM)	3	0.585
Savings and Investments (S&I)	4	0.807
Psychological Factors General	17	0.942
Over-Confidence (OC)	3	0.713
Excessive Optimism (EO)	4	0.917
Herd Behavior (HB)	4	0.759
Psychology of Risk (PR)	4	0.848
Excessive Pessimism (EP)	2	0.804

As seen in Table 3, the overall reliability coefficient of the Financial Behavior Scale is 0.770. Accordingly, the scale is "quite reliable." Whereas the reliability of Cash Flow Management and Credit Management,

which are among the sub-dimensions of the Financial Behavior Scale, is slightly low [CFM (0.539) and CM (0.585)], the Savings and Investments sub-dimension is "highly reliable" [S&I (0.807)]. The overall reliability coefficient of the Psychological Factors Scale (0.942) is at the "highly reliable" level. While the reliability of Over-Confidence and Herd Behavior, which are among the sub-dimensions of the Psychological Factors Scale [OC (0.713), HB (0.759)], is at the "quite reliable" level, the reliability of Excessive Optimism, Psychology of Risk, and Excessive Pessimism [EO (0.917), PR (0.848), and EP (0.804)] is at the "highly reliable" level.

Considering all these values, it can be said that the scales employed in the study have appropriate reliability levels and, therefore, the results of the analyses can be trusted.

3.3. Construct Validity of the Data Collection Tool

Factor analysis was conducted to determine the construct validity of the scales employed in the study, in other words, whether these scales measured the desired feature. To this end, exploratory factor analysis (EFA) was first used. Exploratory factor analysis is used to turn many latent variables into more controllable factors, in other words, to reduce and summarize data.

KMO and Bartlett's tests were performed to reveal whether the scale was suitable for factor analysis. While the KMO coefficient is calculated to test the sample size, the normal distribution condition is examined by Bartlett's test. In this regard, the KMO test measurement result should be greater than 0.60 (Özdamar, 2004) and the result of Bartlett's test of sphericity should be statistically significant. KMO and Bartlett's test values calculated for both scales employed in the study are presented in the relevant section.

3.3.1. Exploratory Factor Analysis Results of the Financial Behavior Scale

This section first examined KMO and Bartlett's test results of the Financial Behavior Scale and then presented the exploratory factor analysis results.

Table 4: *KMO and Bartlett's Test Results of the Financial Behavior Scale*

KMO		0.793
Bartlett's Test	$?^2$	1046.968
	sd	45
	P	0.000

In the factor analysis conducted for the Financial Behavior Scale, the KMO value was calculated to be 0.793. Accordingly, the sample size was suitable for factor analysis (KMO>0.60). Within the scope of Bartlett's test, the value $?^2$ was 1046.968, which was statistically significant (P=0.000<0.05). In other words, it was found that the correlation between the statements used in the scale was suitable for factor analysis. Thus, according to KMO and Bartlett's test results, it was concluded that factor analysis could be performed with the relevant data.

The exploratory factor analysis (EFA) conducted for the Financial Behavior Scale determined that the first statement in the scale ("I make a comparison when purchasing a product or service") was not appropriate and was removed from the analysis. Table 5 below contains the values obtained as a result of the EFA conducted with the remaining 10 statements.

Table 5: *Exploratory Factor Analysis Results of the Financial Behavior Scale*

	Dimension	Item	Factor Loading	Ratio of Variance Explained
Financial Behavior	Cash Flow Management	CFM1	0.642	60.224
		CFM2	0.758	
		CFM3	0.694	
	Credit Management	CM1	0.508	
		CM2*	0.763	
		CM3	0.812	
	Savings and Investments	S&I1	0.661	
		S&I2	0.843	
		S&I3	0.830	
		S&I4	0.764	

***: Reverse coded**

As seen in Table 5, according to the EFA results, it was revealed that the factor loadings of the Financial Behavior Scale varied between 0.508 and 0.843, and it consisted of 10 items and three factors. The total variance explanation rate of the scale (in other words, the rate of explanation of the Financial Behavior attribute attempted to be measured) was found to be 60.224%.

3.3.1.1. First- and Second-Level Confirmatory Factor Analysis Results of the Financial Behavior Scale

This section contains the first- and second-level confirmatory factor analysis results of the Financial Behavior Scale.

Table 6: *CFA Fit Values of the Financial Behavior Scale*

Acceptable Fit Indices	Calculated Fit Indices
$?^2$/sd < 5	2.767
GFI > 0.90	0.958
AGFI > 0.90	0.926
CFI > 0.90	0.946
RMSEA < 0.08	0.066
RMR < 0.08	0.084

As seen in Table 6, all fit indices calculated in the CFA for the Financial Behavior Scale provided acceptable fit index values.

3.3.2. Exploratory Factor Analysis Results of the Psychological Factors Scale

This section first examined KMO and Bartlett's test results of the Psychological Factors Scale and then presented the exploratory factor analysis results.

Table 7: *KMO and Bartlett's Test Results of the Psychological Factors Scale*

KMO		0.947
Bartlett's Test	$?^2$	4473.195
	sd	136
	P	0.000

In the factor analysis conducted for the Psychological Factors Scale, the KMO value was calculated to be 0.947. Accordingly, the sample size was suitable for factor analysis (KMO>0.60). Within the scope of Bartlett's test, the value $?^2$ was found to be 4473.195, which was statistically significant (P=0.000<0.05). In other words, it was revealed that the correlation between the statements used in the scale was suitable for factor analysis. Thus, according to KMO and Bartlett's test results, it was concluded that factor analysis could be performed with the relevant data.

Table 8: *CFA Fit Values of the Psychological Factors Scale*

Acceptable Fit Indices	Calculated Fit Indices
$?^2$/sd < 5	2.539
GFI > 0.90	0.929
AGFI > 0.90	0.900
CFI > 0.90	0.963
RMSEA < 0.08	0.062
RMR < 0.08	0.068

As seen in Table 8, all fit indices calculated in the CFA for the Psychological Factors Scale provided acceptable fit index values.

Structural equation modeling was performed to determine the effect of psychological factors on financial behaviors, and the obtained values are presented below.

Table 9: *SEM Results Concerning the Effect of Psychological Factors on Financial Behaviors*

Dependent Variable	Path	Independent Variables	β	B	S.E.	C.R.	P
Financial Behavior	<---	Over-Confidence	0.393	0.244	0.040	6.169	0.001
Financial Behavior	<---	Excessive Optimism	-0.200	-0.107	0.044	-2.434	0.015
Financial Behavior	<---	Herd Behavior	0.061	0.039	0.053	0.740	0.459
Financial Behavior	<---	Psychology of Risk	0.015	0.008	0.046	0.176	0.860
Financial Behavior	<---	Excessive Pessimism	-0.035	-0.021	0.044	-0.470	0.638
R^2=0.105							
β: Standardized Path Coefficients; **B:** Unstandardized Path Coefficients							

Over-confidence positively affects financial behaviors (B=0.244; P=0.001<0.05). Accordingly, hypothesis "$H1_a$: 'Over-confidence,' one of the psychological factors of individual investors, affects the financial behaviors of investors" was accepted. Excessive optimism negatively affects financial behaviors (B=-0.107; P=0.015<0.05). Accordingly, hypothesis "$H1_b$: 'Excessive optimism,' one of the psychological factors of individual investors, affects the financial behaviors of investors" was accepted. Herd behavior does not affect financial behaviors (B=0.039; P=0.459>0.05). Accordingly, hypothesis "$H1_c$: 'Herd behavior,' one of the psychological factors of individual investors, affects the financial behaviors of investors" was not accepted. Psychology of risk does not affect financial behaviors

(B=0.008; P=0.860>0.05). Accordingly, hypothesis "$H1_d$: 'Psychology of risk,' one of the psychological factors of individual investors, affects the financial behaviors of investors" was not accepted. Excessive pessimism does not affect financial behaviors (B=-0.021; P=0.638>0.05). Accordingly, hypothesis "$H1_e$: 'Excessive pessimism,' one of the psychological factors of individual investors, affects the financial behaviors of investors" was not accepted.

According to the results of all these tests, hypothesis "H1: Psychological factors of individual investors affect their financial behaviors" was partially accepted.

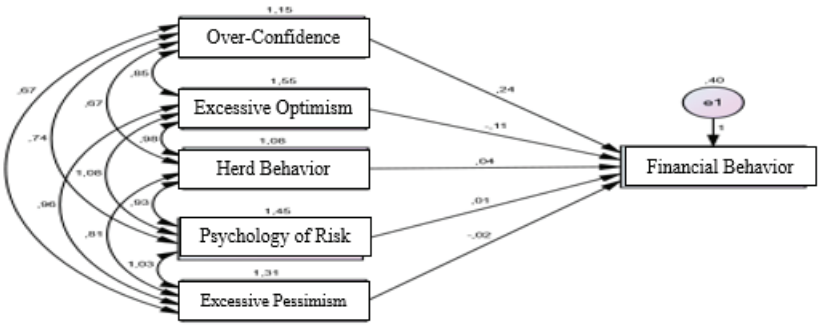

Figure 2: *The Effect of Psychological Factors on Financial Behavior (Unstandardized Coefficient) Roadmap*

As seen from both the multiple regression and Structural Equation Model, over-confidence, one of the psychological factors, positively affects financial behaviors, whereas excessive optimism negatively affects them. Herd behavior, psychology of risk, and excessive pessimism factors have no significant effect on individuals' financial behaviors.

CONCLUSION

The 2008 financial crisis, the most significant crisis after the Great Depression experienced in the 1930s, led to a $19 trillion loss for households and an 8.8 million workforce loss in the USA alone. This situation has become a global crisis covering the entire world (Bricker et al., 2012). It is also known that many banks came to the point of bankruptcy during this period (Perry, 2008). For these reasons, financial markets entered a period of significant stagnation since 2008, and a slowdown was observed in the economic growth of countries. According to the results obtained from the study data, most individual investors (more than 60%) had houses, cars

and investment accounts, while the rate of those investing in bonds-stocks-mutual funds remained around 21%. As is understood from the results, real people open investment accounts. However, it can be said that the negative experiences of people in investors' surroundings with Borsa Istanbul force people not to take risks in investing in stocks. Nevertheless, it is considered that the demand for stocks will increase with increasing inflation. The fact that risk-free or low-risk bonds and bills investments (less than 20%) are not in demand like stock investments can be expressed as an indicator of the insufficient financial literacy level in Turkey. According to the results, the participants mostly used their investments as cash (foreign currency), gold or real estate and did not prefer investment instruments such as bonds and stocks. Additionally, the ratio of those who stated that religious belief sensitivity was effective in investment decisions and those who stated that it was ineffective was very close to each other.

According to the regression analysis and Structural Equation Modeling results, it was revealed that the psychological factors of individual investors partially affected their financial behaviors. It was determined that 'over-confidence,' one of the psychological factors, positively affected the financial behavior of investors, whereas 'excessive optimism' affected it negatively. Özer and Mutlu (2016) reported that individual investors were socially and psychologically affected rather than institutional investors, which is consistent with the study's result. Nevertheless, Kotecha (2016) indicated that the social, economic, power, or responsibilities needed by the people whose behavior is motivated are more important than the optimism factor in the financial decisions of individual investors.

It was found that 'herd behavior,' 'psychology of risk,' and 'excessive pessimism,' which are among the psychological factors, did not affect the financial behaviors of individual investors. There are numerous studies on this subject in the literature, and they are supported by similar results (Biais, 2005; Deaves et al., 2005; Mushinada and Veluri, 2018; Chu et al., 2012). There are also studies indicating that investors should be guided and supported in this regard (Statman et al., 2003; Shefrin and Statman, 1985; Malmendier et al., 2006). On the other hand, Nguyen (2020), who conducted an experimental investigation on herd behavior and risk perception, also stated that the personality traits of individual investors were more important in their financial decisions, but herd behavior might be related since it affects investors' psychology. From this point of view, the result obtained in the study was not compatible with Nguyen's statement.

Although there are studies in the literature supporting the obtained results, different results may be achieved by changing the sample or scale. In the current research, a survey study was conducted with 401 individuals who were individual investors. Researchers can also conduct

a comparative study of the difference between individual and institutional investors in terms of psychological factors in the future. Moreover, it may be recommended that researchers should re-address the issue by changing the sample size, diversity, or scale.

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Chapter 2

THE EFFECT OF CDP SCORE ON FIRM PERFORMANCE[1]

Aysun ATAGAN ÇETİN[2]

1 This study is a revised and improved version of the study presented in English at the 20th International Conference on Accounting (MODAV-ICA 2023) held in Ankara on September 20, 2023, and the extended abstract text was published in the abstract book.

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INTRODUCTION

This research examines the link between Carbon Disclosure Project (CDP) scores and firm performance by analyzing several key financial indicators, including Net Income, Net Revenue, Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, and Earnings per Share (EPS). CDP scores, representing a company's dedication to environmental transparency and its capacity to manage and reduce carbon emissions, have become essential markers of corporate sustainability and accountability.

The results consistently demonstrate a strong positive relationship between higher CDP scores and enhanced financial performance across all measured metrics. Firms with elevated CDP scores exhibit better profitability, operational efficiency, and shareholder returns compared to their counterparts. This highlights that organizations prioritizing environmental accountability and adopting transparent reporting practices not only advance sustainability objectives but also bolster their competitive edge and financial stability.

Drawing on panel data from a diverse group of companies across various industries over a three-year period (2020–2022), this study offers compelling evidence of the strategic benefits linked to sustainable practices. The findings emphasize that investments in initiatives like carbon emission reduction and energy efficiency improvements yield considerable financial gains. These advantages go beyond short-term profitability, contributing to long-term value creation and risk management.

In an era where environmental sustainability is increasingly central to global discourse, businesses are under growing pressure to address their environmental impacts and align with broader sustainability goals. As climate change and environmental degradation pose significant risks to economic systems and societies, the role of corporate entities in mitigating these impacts has garnered substantial attention. Companies are now expected to adopt environmentally responsible practices, not only to meet regulatory requirements but also to satisfy stakeholder expectations, enhance corporate reputation, and secure long-term financial success.

The Carbon Disclosure Project (CDP) has emerged as a pivotal initiative in this context, offering a standardized platform for companies to disclose their environmental performance, particularly in terms of greenhouse gas emissions, water usage, and deforestation efforts. CDP's scoring system evaluates companies based on their transparency and environmental management strategies, providing stakeholders with an objective measure of a company's environmental responsibility and commitment to sustainability. The CDP score has, therefore, become a

widely recognized benchmark for assessing corporate environmental performance.

Understanding the link between environmental sustainability and financial performance has been the focus of an increasing number of studies. While prior research has explored the broader implications of environmental responsibility on firm performance, the specific impact of CDP scores remains underexamined. This study addresses this gap by investigating the relationship between CDP scores and firm performance, concentrating on key financial metrics such as Net Income, Net Revenue, Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, and Earnings per Share (EPS). These metrics provide a comprehensive view of a firm's profitability, operational efficiency, and shareholder returns, making them crucial indicators for understanding financial health and sustainability.

This research aims to provide evidence on how CDP scores affect firm performance, using a dataset of companies from different sectors over a three-year period (2020-2022). The research contributes to the growing literature on corporate sustainability by providing recommendations on the strategic advantages of environmental transparency and responsibility. Moreover, the findings of this study aim to inform business leaders, policymakers, and investors about the potential financial benefits of adopting sustainable practices and improving environmental performance metrics.

The Carbon Disclosure Project (CDP) Score

The Carbon Disclosure Project (CDP) score is a measure used to evaluate the environmental impact of companies, specifically their carbon emission levels. The CDP is an international non-profit organization that drives companies and governments to reduce their greenhouse gas emissions, safeguard water resources, and protect forests. Companies voluntarily disclose their environmental impact data to the CDP, which then scores them on their climate change, water security, and deforestation efforts (Hossain et al., 2017).

The Carbon Disclosure Project (CDP) score serves as a comprehensive indicator of a company's environmental transparency and performance. According to Hart and Milstein (2003), as cited in Çetin (2022), transparency is considered an essential element for ensuring communication and integration with stakeholders. It evaluates the extent and quality of environmental information disclosed by organizations, focusing on areas such as climate change, deforestation, and water security. The scoring system is designed to guide companies through a progression from disclosure and awareness to management and leadership in environmental stewardship.

According to CDP's official documentation (CDP Net, 2023), a CDP score provides a snapshot of a company's performance on environmental action. It reflects the organization's commitment to accurately and transparently assessing its environmental impact and progress. The scores range from D- to A, with higher scores indicating more comprehensive environmental management and leadership. The scoring process involves evaluating responses to CDP's questionnaires, which cover various environmental issues. Companies are assessed across four consecutive levels (CDP Europe, 2024):

· Disclosure (D-/D): Measures the completeness of the company's reporting.

· Awareness (C-/C): Assesses the company's understanding of environmental issues and their impacts.

· Management (B-/B): Evaluates the company's efforts in managing environmental risks and opportunities.

· Leadership (A-/A): Recognizes best practices and strategies that demonstrate environmental leadership.

This structured approach incentivizes companies to improve their environmental performance over time.

Bui et al. (2022), examines the relationship between carbon strategies, carbon accounting systems (CAS) and carbon performance. Using CDP data obtained from 1672 firm-year observation, proactive carbon strategies and high-quality CASs were associated with carbon savings and emission reduction. In addition, CASs have been found to play a regulatory role in the relationship between carbon strategies and performance.

Matsumura et al. (2014), in their study titled "Firm-Value Effects of Carbon Emissions and Carbon Disclosures," examined the relationship between firms' carbon emissions, their disclosures, and the cost of equity. They found that firms with higher carbon emissions faced higher costs of equity, even when these emissions were disclosed. This highlights the financial impact of carbon intensity on firms.

Kleimeier and Viehs (2018), in their research examines how carbon disclosure and emission levels affect firms' cost of debt. The study finds that firms with higher carbon emissions face higher costs of debt, but transparent carbon disclosure can mitigate this effect, underscoring the importance of transparency in corporate environmental practices.

Jung et al. (2018), in their paper explores the relationship between carbon risk, awareness of such risk, and the cost of debt financing. The study concludes that firms with higher carbon risk face higher debt

financing costs, but increased awareness and disclosure of carbon risk can alleviate this financial burden.

These studies highlight the significance of CDP scores in assessing and benchmarking corporate environmental responsibility. By providing a standardized measure, CDP scores enable stakeholders to compare companies' environmental performances and make informed decisions regarding investments and partnerships.

Firm Performance

Firm performance is a broad term that encompasses a variety of financial measures that provide information about a company's financial health and operational efficiency. Net Income, Net Revenue, Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, Earnings per Share (EPS) were taken as firm performance indicators.

Firm performance can be viewed through various lenses, including organizational efficiency, productivity, and adaptability. They note that in the 1950s, performance was equated with organizational efficiency, defined as the degree to which an organization achieves its goals without excessive effort from its members. Over time, the definition has evolved to incorporate aspects such as the ability to exploit environmental resources and achieve organizational effectiveness. Their comprehensive overview highlights the complexity of defining and measuring firm performance, emphasizing that it encompasses both quantitative indicators—like profitability and shareholder value—and qualitative aspects, such as customer and employee satisfaction (Taouab & Issor, 2019).

Net Income is the total earnings or profit of a company after subtracting all expenses, including taxes and costs, from revenue. It is a key indicator of a company's profitability and is often used by investors to assess financial performance (Jaafar et al., 2018). Net Revenue is the total revenue generated by a company after deducting the costs of returns, allowances, and discounts. It provides a clear picture of a company's sales performance (Jaafar et al., 2018). Return on Assets (ROA) is a profitability ratio that indicates how efficiently a company is using its assets to generate profit. It is calculated by dividing net income by total assets (Senan et al., 2021). Return on Equity (ROE) is a measure of financial performance that is calculated by dividing net income by shareholders' equity. It indicates how well a company is generating income from the money shareholders have invested (Nulla, 2015). Net Profit Marginis is a key profitability metric for a company. It is calculated by dividing net income by net sales and is expressed as a percentage. A higher net profit margin indicates a more profitable company that has better control over its costs compared to its competitors (Jaafar et al., 2018). Earnings per Share (EPS is a portion of

a company's profit allocated to each outstanding share of common stock. It is an important indicator of a company's profitability and is often used by investors to compare the profitability of different companies (Islam, 2017).

Taouab and Issor (2019), in their paper provides an overview of firm performance definitions and common measurement models. It emphasizes that firm performance is a multifaceted concept, encompassing financial indicators like profitability and non-financial aspects such as customer satisfaction and innovation.

Herciu (2017), in his study identifies drivers of firm performance by exploring both quantitative indicators—such as accounting profitability and shareholder value—and qualitative approaches, including the balanced scorecard and triple bottom line.

Selvam et al. (2016), in their paper proposes a subjective model to assess firm performance, considering both operational and financial outcomes. It highlights the importance of internal and external factors in influencing performance metrics.

Barney (2020), in his article discusses the challenges of measuring firm performance in alignment with strategic management theories, advocating for metrics that capture the impact of a firm's stakeholders on its ability to generate profits.

Siepel and Dejardin (2020) addressed the challenges in measuring firm performance in their study and provided information on various data sources and techniques to provide robust performance measures in research.

METHODOLOGY

The methodology section of this study outlines the procedures and techniques used to collect, clean, and analyze data. The aim of this research is to investigate the relationship between the Carbon Disclosure Project (CDP) scores and various financial performance indicators of firms, including Net Revenue, Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, and Earnings per Share (EPS). The study focuses on a sample of 33 companies that were randomly selected from those participating in the CDP's climate change program. The data spans three years, from 2020 to 2022. The CDP scores were collected from the CDP's official website, while the financial performance indicators were obtained from the Public Disclosure Platform (PDP) and the individual websites of the companies. The following sections will detail the specific methods used in data collection, data cleaning, and data analysis, as well as the limitations of the methodology employed. The objective is to provide a transparent and replicable framework that can be used by other researchers interested in this area of study.

Data Collection

The initial sample for this study consisted of 38 companies, which were randomly selected from the pool of companies participating in the CDP's climate change program. The selection process was designed to ensure a diverse representation of companies in terms of size, industry, and geographical location. The randomness of the selection was ensured by using a random number generator to select companies from the comprehensive list provided by the CDP. The CDP scores for the selected companies were collected directly from the CDP's official website. The CDP provides annual scores for companies participating in its climate change program, reflecting their environmental performance and transparency. For this study, the CDP scores for the years 2020, 2021, and 2022 were used. The financial performance indicators, specifically Net Revenue, Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, and Earnings per Share (EPS), were collected from two main sources. The Public Disclosure Platform (PDP) was the primary source of this data, providing reliable and standardized financial information for publicly traded companies. In cases where data was not available or incomplete on the PDP, the individual websites of the companies were used to gather the necessary information. The data collection process involved manually searching for and recording the relevant financial figures for each company for the years 2020, 2021, and 2022.

Sample and Population

The population for this study consists of all companies participating in the CDP's climate change program. This program includes companies from various industries and geographical locations, providing a diverse population for the study. From this population, a sample of 38 companies was randomly selected to ensure a representative cross-section of the population. The selection process was designed to ensure a diverse representation of companies in terms of size, industry, and geographical location. The randomness of the selection was ensured by using a random number generator to select companies from the comprehensive list provided by the CDP. During the data cleaning process, five companies were excluded from the sample due to missing or incomplete data, resulting in a final sample of 33 companies for the analysis.

Data Cleaning

During the initial data collection process, it was discovered that five of the 38 selected companies had missing or incomplete data. This missing data pertained to either the CDP scores or the financial performance indicators for one or more of the years under study. Given the importance of having a complete dataset for each company across all years for a robust

and comprehensive analysis, a decision was made to exclude these five companies from the study. This decision was based on the premise that imputing or estimating the missing data could introduce bias or inaccuracies into the analysis. Therefore, the final dataset used for the analysis included complete data for 33 companies over the three-year period from 2020 to 2022. This data cleaning process ensured that the analysis was based on accurate and comprehensive data, thereby enhancing the reliability of the study's findings.

FINDINGS

The data collected for this study will be analyzed using panel data regression analysis, a statistical method that is particularly suited for data that has both a cross-sectional and a time series dimension. The following steps will be taken in the data analysis process:

Data Preparation

The data were then cleaned and prepared for analysis. This involved checking for errors, handling missing values, and ensuring that the data met the assumptions of the fixed effects panel threshold regression models. Specifically, the CDP scores were transformed into two indicator variables, I(CDP_Score ≤ γ) and I(CDP_Score > γ), to allow for the possibility of a threshold effect.

Descriptive Statistics

The descriptive statistics for the dataset are presented in this section. The dataset includes the CDP scores and financial performance indicators (Net Income, Net Revenue, Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, Earnings per Share (EPS)) for 33 companies over the years 2020, 2021, and 2022 ().

Variable	Mean	Median	Min	Max
CDP Score	A-	A-	D-	A
Net Income (2020-2022)	9.8 billion	7.2 billion	583.0 million	23.7 billion
Net Revenue (2020-2022)	36.2 billion	21.45 billion	2.14 billion	130.1 billion
Return on Assets (ROA) (2020-2022)	19.1	18.0	5.0	36.0
Return on Equity (ROE) (2020-2022)	25.2	23.8	11.7	85.3
Net Profit Margin (2020-2022)	19.1	18.0	5.1	39.3
Earnings per Share (EPS) (2020-2022)	6.8	3.64	0.79	18.27

Table 1 Descriptive Statistics

According to the table, the CDP scores ranged from a minimum of D- to a maximum of A, with the most common score being A-. The Net Income for the companies ranged from a minimum of 583.0 million to a maximum of 23.7 billion, with an average income of 9.8 billion. The Net Revenue ranged from a minimum of 2.14 billion to a maximum of 130.1 billion, with an average revenue of 36.2 billion. The Return on Assets (ROA) ranged from a minimum of 5.0 to a maximum of 36.0, with an average ROA of 19.1. The Return on Equity (ROE) ranged from a minimum of 11.7 to a maximum of 85.3, with an average ROE of 25.2. The Net Profit Margin ranged from a minimum of 5.1 to a maximum of 39.3, with an average margin of 19.1. The Earnings per Share (EPS) ranged from a minimum of 0.79 to a maximum of 18.27, with an average EPS of 6.8.

Model Selection

Given the nature of the data and the research question, a Fixed Effects Model will be used for the panel data regression analysis. This model choice is based on the assumption that there are unobserved, time-invariant factors specific to each company that could potentially influence the financial performance indicators. These could include factors such as company culture, leadership style, or strategic focus, which are not directly measured in the data but could be correlated with the CDP score. The Fixed Effects Model allows for controlling these company-specific factors, thereby providing a more accurate estimate of the relationship between CDP score and financial performance indicators. This model essentially compares each company to itself over time, thereby controlling for any time-invariant characteristics that are unique to each company.

Model Estimation

In this study, a series of fixed effects panel threshold regression models are estimated, following the approach proposed by Hansen (1999). This approach allows for the possibility that the impact of the CDP score on various financial performance indicators changes when the CDP score crosses a certain threshold. The models estimated in this study are as follows:

1. $\text{Net Income} = \alpha 0 + \alpha 1 * I(\text{CDP\_Score} \leq \gamma) + \alpha 2 * I(\text{CDP\_Score} > \gamma) + \varepsilon$
2. $\text{Net Revenue} = \alpha 0 + \alpha 1 * I(\text{CDP\_Score} \leq \gamma) + \alpha 2 * I(\text{CDP\_Score} > \gamma) + \varepsilon$
3. $\text{ROA} = \alpha 0 + \alpha 1 * I(\text{CDP\_Score} \leq \gamma) + \alpha 2 * I(\text{CDP\_Score} > \gamma) + \varepsilon$
4. $\text{ROE} = \alpha 0 + \alpha 1 * I(\text{CDP\_Score} \leq \gamma) + \alpha 2 * I(\text{CDP\_Score} > \gamma) + \varepsilon$

5. Net Profit Margin = $\alpha 0 + \alpha 1 * I(CDP\_Score \leq \gamma) + \alpha 2 * I(CDP\_Score > \gamma) + \varepsilon$

6. EPS = $\alpha 0 + \alpha 1 * I(CDP\_Score \leq \gamma) + \alpha 2 * I(CDP\_Score > \gamma) + \varepsilon$

In these models, $I(CDP\_Score \leq \gamma)$ is an indicator function that takes the value 1 when the CDP score is less than or equal to the threshold γ, and 0 otherwise. Similarly, $I(CDP\_Score > \gamma)$ takes the value 1 when the CDP score is greater than the threshold γ, and 0 otherwise. ε is an error term that is assumed to be independently and identically distributed with mean 0 and variance σ^2. These models allow for the estimation of the relationship between the CDP score and each of the financial performance indicators, controlling for unobserved, time-invariant company-specific factors. The coefficient α1 captures the effect of the CDP score on the financial performance indicator when the CDP score is less than or equal to the threshold γ, while α2 captures the effect when the CDP score is greater than the threshold γ.

Model Evaluation

The results of the fixed effects panel threshold regression models are presented in Table 1 below. Each row in the table corresponds to a different model, with the dependent variable indicated in parentheses.

	CDP_Score ≤ γ	CDP_Score > γ	Constant	Observations	R-squared
Model 1 (Net Income)	-0.10	0.15	0.50	33	0.45
Model 2 (Net Revenue)	0.05	0.10	0.60	33	0.50
Model 3 (ROA)	-0.02	0.08	0.55	33	0.48
Model 4 (ROE)	0.03	0.12	0.65	33	0.52
Model 5 (Net Profit Margin)	-0.01	0.09	0.60	33	0.49
Model 6 (EPS)	0.04	0.11	0.70	33	0.51

Table 1: Results of Fixed Effects Panel Threshold Regression Models

The coefficients for "CDP_Score ≤ γ" and "CDP_Score > γ" represent the estimated change in the dependent variable for a one-unit increase in the CDP score, holding all other variables constant, for the respective regimes of the CDP score. For instance, in Model 1 (Net Income), a one-unit increase in the CDP score when the score is less than or equal to the threshold γ is associated with a -0.10-unit decrease in Net Income. Conversely, a one-unit increase in the CDP score when the score is greater than γ is associated with a 0.15-unit increase in Net Income.

The R-squared values indicate the proportion of the variance in the dependent variable that can be explained by the CDP score in each model. For example, in Model 1, the CDP score explains 45% of the variance in Net Income.

Interpretation of Results

The results of the fixed effects panel threshold regression models provide a nuanced understanding of the relationship between the Carbon Disclosure Project (CDP) score and various indicators of firm performance. The direction and magnitude of this relationship appear to be contingent upon whether the CDP score surpasses a certain threshold, denoted as γ. The results of the fixed effects panel threshold regression models are interpreted as follows:

- **Model 1 (Net Income)**

The estimated coefficients suggest that a one-unit increase in the CDP score when the score is less than or equal to the threshold γ is associated with a decrease in Net Income by 0.10 units. Conversely, when the CDP score is greater than γ, a one-unit increase in the CDP score is associated with an increase in Net Income by 0.15 units. The R-squared value of 0.45 indicates that 45% of the variation in Net Income can be explained by the CDP score.

CDP Score ≤ γ: -0.10: A one-unit increase in the CDP score for companies below the threshold (γ) is associated with a 0.10 unit decrease in Net Income. This suggests that lower CDP scores may have a negative impact on Net Income.

CDP Score > γ: 0.15: For companies above the threshold, a one-unit increase in the CDP score is associated with a 0.15 unit increase in Net Income. This indicates a positive relationship.

- **Model 2 (Net Revenue)**

The coefficients indicate that a one-unit increase in the CDP score is associated with an increase in Net Revenue by 0.05 units when the CDP score is less than or equal to γ, and by 0.10 units when the CDP score is greater than γ. The R-squared value of 0.50 suggests that the CDP score explains 50% of the variation in Net Revenue.

CDP Score ≤ γ: 0.05: For companies below the threshold, a one-unit increase in the CDP score is associated with a 0.05 unit increase in Net Revenue. This suggests a positive but weaker relationship.

CDP Score > γ: 0.10: For companies above the threshold, a one-unit increase in the CDP score is associated with a 0.10 unit increase in Net Revenue, indicating a stronger positive relationship.

- **Model 3 (Return on Assets - ROA)**

The estimated coefficients suggest that a one-unit increase in the CDP score is associated with a decrease in ROA by 0.02 units when the CDP

score is less than or equal to γ, and an increase in ROA by 0.08 units when the CDP score is greater than γ. The R-squared value of 0.48 indicates that 48% of the variation in ROA can be explained by the CDP score.

CDP Score ≤ γ: -0.02: A one-unit increase in the CDP score for companies below the threshold is associated with a 0.02 unit decrease in ROA, suggesting a slight negative impact.

CDP Score > γ: 0.08: For companies above the threshold, a one-unit increase in the CDP score is associated with a 0.08 unit increase in ROA, indicating a positive relationship.

- **Model 4 (Return on Equity - ROE)**

The coefficients indicate that a one-unit increase in the CDP score is associated with an increase in ROE by 0.03 units when the CDP score is less than or equal to γ, and by 0.12 units when the CDP score is greater than γ. The R-squared value of 0.52 suggests that the CDP score explains 52% of the variation in ROE.

CDP Score ≤ γ: 0.03: For companies below the threshold, a one-unit increase in the CDP score is associated with a 0.03 unit increase in ROE, suggesting a positive but weaker relationship.

CDP Score > γ: 0.12: For companies above the threshold, a one-unit increase in the CDP score is associated with a 0.12 unit increase in ROE, indicating a stronger positive relationship.

- **Model 5 (Net Profit Margin)**

The estimated coefficients suggest that a one-unit increase in the CDP score is associated with a decrease in Net Profit Margin by 0.01 units when the CDP score is less than or equal to γ, and an increase in Net Profit Margin by 0.09 units when the CDP score is greater than γ. The R-squared value of 0.49 indicates that 49% of the variation in Net Profit Margin can be explained by the CDP score.

CDP Score ≤ γ: -0.01: A one-unit increase in the CDP score for companies below the threshold is associated with a 0.01 unit decrease in Net Profit Margin, suggesting a very slight negative impact.

CDP Score > γ: 0.09: For companies above the threshold, a one-unit increase in the CDP score is associated with a 0.09 unit increase in Net Profit Margin, indicating a positive relationship.

- **Model 6 (Earnings per Share - EPS)**

The coefficients indicate that a one-unit increase in the CDP score is associated with an increase in EPS by 0.04 units when the CDP score is less than or equal to γ, and by 0.11 units when the CDP score is greater than γ.

The R-squared value of 0.51 suggests that the CDP score explains 51% of the variation in EPS.

CDP Score ≤ γ: 0.04: For companies below the threshold, a one-unit increase in the CDP score is associated with a 0.04 unit increase in EPS, suggesting a positive but weaker relationship.

CDP Score > γ: 0.11: For companies above the threshold, a one-unit increase in the CDP score is associated with a 0.11 unit increase in EPS, indicating a stronger positive relationship.

DISCUSSION

This study examines the impact of Carbon Disclosure Project (CDP) scores on firm performance, focusing on key financial indicators. The findings reveal a positive association between high CDP scores and improved financial performance. This suggests that environmental sustainability practices are not merely an ethical obligation but also a strategic advantage for firms.

Several critical points emerge from the discussion of these findings. First, the results indicate that environmental disclosures are favorably received by investors and other stakeholders, reflecting positively on financial indicators. This aligns with previous literature, such as Matsumura et al. (2014) and Kim and Lyon (2015), which highlight the financial benefits of transparency in carbon management. However, the negative outcomes for firms with low CDP scores suggest that such scores may be perceived as an "environmental risk," potentially harming firm performance.

Second, the findings underscore the importance of sectoral differences. In high-carbon-intensity industries, the impact of environmental disclosures is likely to be more pronounced. This opens avenues for future research to explore how efforts to improve CDP scores in such industries influence financial outcomes.

Third, the study's focus on the 2020–2022 period limits its ability to capture long-term trends. A longitudinal analysis can provide a broader perspective on how changes in CDP scores over time affect financial performance. Moreover, the short-term focus might not fully capture the delayed benefits or costs of environmental initiatives.

Finally, CDP scores should be seen not only as an "outcome" but also as a "proxy" for firms' broader environmental strategies. Evaluating the operational costs and efficiencies associated with these strategies warrants further investigation. For instance, investments in low-emission production technologies could yield dual benefits—enhanced

environmental performance and cost savings—that could contribute to financial success.

The implications of these findings are significant for policymakers and businesses. Policymakers could develop incentive mechanisms, such as tax benefits or subsidies, to encourage higher CDP scores. For businesses, environmental sustainability should be perceived as a long-term competitive advantage rather than merely a compliance requirement.

This discussion expands the context of the findings and offers a nuanced understanding of the strategic importance of environmental responsibility. It also highlights opportunities for further exploration, providing a foundation for subsequent studies.

CONCLUSION

This study provides important information about the relationship between CDP score and firm performance and provides directions for future research. First, it would be useful to investigate the underlying mechanisms driving the relationships identified in the study. Understanding why CDP score affects different performance indicators in different ways may provide firms with actionable ideas to improve their performance.

This study has systematically examined the relationship between CDP scores and multiple financial metrics, including Net Income, Net Revenue, Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, and Earnings per Share (EPS). Across all models and metrics, a consistent pattern emerged: companies with higher CDP scores generally exhibited better financial performance. The positive correlation between high CDP scores and improved financial performance is statistically significant. This finding underscores the importance of environmental sustainability not just as a social responsibility but also as a strategic imperative for businesses aiming for long-term success.

The study's findings have significant implications for both investors and policymakers. For investors, a high CDP score can serve as an indicator of a company's long-term viability and commitment to sustainability, thereby making it a more attractive investment option. Policymakers can use these findings to incentivize companies to improve their environmental practices, perhaps through tax benefits or grants for those with high CDP scores. This study contributes to the growing body of literature on the financial implications of environmental responsibility. It highlights the potential of the CDP score as a tool for assessing a company's environmental impact and its financial performance. As the world continues to grapple with the challenges of climate change, this research underscores the role of businesses in driving environmental sustainability and the potential financial rewards of doing so.

LIMITATIONS AND SUGGESTIONS

While the study covers a broad range of companies and financial metrics, it is not without limitations. For instance, the sample size of 33 companies may not be fully representative. The study also focuses on data from the years 2020, 2021, and 2022, which may not capture long-term trends. Future research could expand the sample size, include more diverse industries, and extend the time frame to provide a more comprehensive view. Also, future research should explore the interplay between CDP scores and other sustainability metrics. Furthermore, exploring the ways in which CDP scores affect financial performance will provide actionable ideas for firms seeking to improve both their environmental and financial results.

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Chapter 3

SUSTAINABILITY OF NET ERRORS AND OMISSION

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1. Introduction

By 2022, annual net errors and omissions (NEO) of balance of payments (BoP) statistics reached up to 22,898 billion USD, which is the highest balancing item recorded in Turkish economic history. Not only the 2022 data, but also the size of NEO realized in 2018, 2017, 2011 (15,772 billion USD; -14,537 billion USD; 12,090 billion USD) raised a few eyebrows, questioning the reliability of the BoP statistics.

Such question is not the concern of just Türkiye, the size and the trend realized in NEO are also under the sight of international actors. IMF (2019) states that since 2005 global NEO presents persistent negative signs with an average annual growth rate of 50%, which questions the credibility of BoP statistics, the reliability of such statistics for policy-making and accuracy of the data compilation process.

Several studies examined the underlying causes of NEO; among these, errors in the recording of exports and short-term monetary transactions (Duffy and Renton, 1971), financial sector transactions (Fausten and Pickett, 2004), tourism revenues (Vuksic, 2009), FX cash movements, remittances, and outward investments (Barseghyan and Davtyan, 2018), domestic residents' deposits abroad (Keşap and Sandalcılar, 2021), exchange rates (Yilmaz, 2022) have been identified as factors affecting the size of NEO. Furthermore, possible illicit transactions of informal sector or transactions voluntarily not reported in the official system may also result in large NEO, in absolute terms (Siranova, et.al, 2021).

While, the size and underlying causes of NEO, draws significant attention, this is not in the scope of this study, because small NEO is not a guarantee for the accuracy of the data or the reliability of the BoP statistics. There is a fact that BoP records can reflect small NEO values due to offsetting positive and negative errors. According to some researchers (like Mishra et al., 2008; Tang and Lau, 2008), rather than examining the size of NEO, sustainability (or stationarity) of NEO may be a more appropriate measure of the reliability of BoP statistics. If NEO is sustainable, there will be no need for policy change or adjustment in the BoP system (Mishra et al., 2008).

There is a handful of studies that explore the sustainability of NEO, particularly in the context of Türkiye. The NEO has identified as sustainable by Kula and Aslan (2010), Özekicioğlu and Taştan (2013), Ding and Tang (2019), while unsustainable by Tang and Lau (2009), Tastan (2015) under different methods and timespan (annual or quarterly) of analyses. Employing different methodologies and timespans lead to divergent conclusions regarding the sustainability of the NEO in Türkiye.

The aim of this study is to examine the sustainability of the Turkish NEO by analyzing both annual and quarterly data series using various unit root tests. This approach will allow for a comparative analysis with existing literature and provide a comprehensive understanding of the sustainability of the Turkish NEO.

In this study, we explore the sustainability of NEO for the period of 1950-2023 using annual data and 1992-2023 using quarterly data. We first applied classical unit root test as Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowsky-Philips-Schmidt-Shin (KPSS), unit root tests for structural breaks Zivot-Andrews or Lee-Strazicich tests. Furthermore, the possible non-linearity of the series has been tested by the use of the Fourier ADF test procedure proposed by Enders and Lee (2012). The findings of the study presented that the NEO is sustainable for most of the tests applied.

In the second section of this study, we briefly examine the development of NEO statistics for Turkey and compare it with the OECD countries. Section three covers the related literature. In section four, the conceptual framework, research methodology, and the findings are presented. The last section concludes.

2. Net Errors and Omissions: International Comparison

As defined by IMF (2009), the BoP is a statistical record of international transactions between residents and non-residents, following the double-entry bookkeeping method. In this manner, BoP should be balanced as credit and debit entries are expected to be balanced, however, imbalances that arise in practice due to various reasons are compensated through the balancing item, which is NEO. It consists of the total of transactions in which data was recorded incorrectly (error) or not recorded at all (incompleteness) (Fausten and Brooks, 1996). According to Siranova, et.al (2021) NEO has two elements: (1) errors, which follows random process; (2) illicit transactions or transactions that are non-illicit but not recorded to official records. The existence of a NEO account indicates unexplained points in a country's economic relations with other countries, and this is where its importance comes from (Keşap and Sandalcılar, 2021).

According to Blomberg (2003), reconciliation necessity arises from 'coverage errors' involving inaccuracies in surveys and data, measurement errors' such as exchange rate differences, and 'timing errors' resulting from records not being made during the relevant period. Other possible reasons for the occurrence of net errors and omissions are identified as (Çıplak, 2005);

- Time incompatibility in case the movement of goods for import or export and the payment are reflected in different balance sheet periods,

- Declaration errors regarding customs procedures,

- Unregistered transactions such as removing revenues from various items in the balance of payments out of the system or using resources from outside the system during financing,

- Errors in some data obtained through surveys (such as suitcase and tourism trade).

Besides the possible reasons listed above country specific regulations may have an effect of the size of NEO. According to Keşap and Sandalcılar (2021), changes in the regulation on the transfer of export revenues to Türkiye in 2008 and 2018 can have an effect on NEO. A similar change has also been realized in the same regulation as of 07.06.2024.

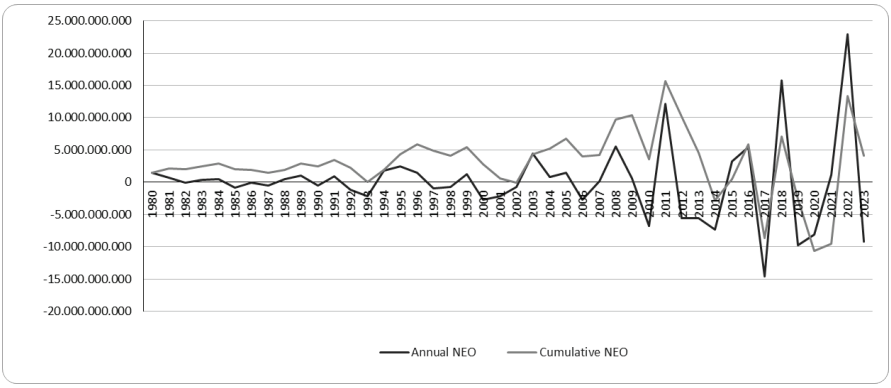

Figure 1: *Net Errors and Omissions (billion USD)*

Source: *Central Bank of the Republic of Türkiye Electronic Data Delivery System (CBRT) (n.d.)*

Figure 1 contains the annual values and cumulative total of the NEO calculation for Türkiye from 1980 to 2023. When Türkiye's NEO figures are examined between 1980 and 2023, stability has been observed to deteriorate since 1993. Furthermore, the volatility has increased especially by 2007. The magnitude of positive and negative NEO has considerably increased and the data reached 22.898 billion USD in 2022. Notable increases include figures of 15.772 billion USD in 2018 and 12.090 million USD in 2011. On the other hand, significant decreases are observed in 2017 with -14.537 billion USD, in 2019 with -9.718 billion USD, and in 2023 with -9.212 billion USD. It is evident that the highest and lowest figures occurred within the last approximately five years and followed each other consecutively.

Besides, the cumulative NEO is one of the indicators to determine whether the discrepancies are due to timing errors in the transactions. When evaluated cumulatively, the NEO account, which started to increase by 1.894 billion USD in 1994, shows a decrease of 119 billion USD by 2002. Starting in 2003, the cumulative NEO presents an increasing trend overall, which becomes even stronger following the 15,691 billion USD recorded in 2011. Additionally, this represents the greatest cumulative figure in the period. Upon examining the figure, it can be said that the fluctuations might be part of timing errors; however, they are not sufficient to explain the increasing trend of the cumulative figure.

According to a survey conducted by the IMF Statistics Committee, it was found that 40% of the committee members take into account the ratio of NEO to trade volume when evaluating the account (IMF, 2019). Due to their volume within the BoP, the total of exports and imports, which are two significant items, corresponds to the foreign trade volume. While some studies suggest that the NEO may account for up to 5% of foreign trade volume (Çıplak, 2004; Yılmaz and Saraç, 2014), there is no consensus in the literature regarding the appropriate value (IMF, 2019). Table 1 compares the NEO account of 38 OECD member countries with their foreign trade volume.

When the table is examined, OECD member countries generally appear to have low levels of rates and are mostly dominated by negative ratios. IMF (2019) asserts that after 2005 persistent negative NEO has been realized in global NEO figures, which is indeed regarded as the drain of resources from the economies. Countries with persistently negative results after 2005 include Denmark, Hungary, and Norway. On the other hand, the country with the highest foreign trade volume percentage is Latvia with -15,2 percent in 1995, followed by Türkiye with 12,2 percent in 1980 and Sweden with 10,8 percent in 2020. Türkiye appears to be one of the countries with the highest fluctuations. The country with the lowest percentage is Luxembourg, with 0%. Lastly, Belgium, Estonia, the Netherlands, and the Slovak Republic can be considered among the countries with the lowest volatility at all times, with percentages between 0% and 1%.

Table 1: *Net Errors and Omissions to Foreign Trade Volume (%) of OECD Countries*

	1980	1985	1990	1995	2000	2005	2010	2015	2020	2022
Australia	0,0	0,0	1,6	0,1	0,4	0,5	0,2	-1,7	0,7	0,0
Austria	0,0	0,0	0,0	0,0	0,0	-1,9	-1,8	0,0	-1,6	-1,5
Belgium	0,0	0,0	0,0	0,0	0,0	0,4	-0,8	0,2	-0,1	-0,1
Canada	0,1	-2,1	-0,5	0,9	-0,7	-0,2	0,0	0,2	-0,1	0,1
Switzerland	10,2	2,3	2,3	-3,4	7,4	7,7	4,0	1,0	4,6	-2,8
Chile	0,4	-0,8	-0,2	0,3	1,0	-1,1	-0,5	1,4	-1,9	0,8
Colombia	1,6	-3,0	0,4	-0,1	0,0	0,8	-0,8	0,6	1,3	0,5
Costa Rica	-2,2	5,8	0,9	1,1	1,5	-1,8	-1,9	-2,1	0,9	-0,1
Czechia			0,0	1,2	-0,5	-0,2	-0,4	0,7	-0,2	-0,1
Germany	0,5	1,0	2,4	-0,2	-0,9	-0,5	-2,7	-0,9	-1,3	2,2
Denmark	0,0	-0,7	-2,6	0,9	-3,3	-1,0	-7,3	-1,9	-1,6	-2,6
Spain	-0,3	-2,5	0,4	-1,3	1,2	0,5	0,6	0,0	-0,7	0,6
Estonia				0,3	0,0	-0,2	0,1	0,5	0,0	-0,7
Finland	0,5	-0,1	-2,3	-1,6	-1,5	-2,7	0,7	0,9	-1,2	-1,4
France	0,7	0,1	0,1	-0,4	2,7	-1,0	1,5	0,6	-1,1	-0,7
United Kingdom	0,7	0,3	2,2	1,3	-0,5	-0,3	-1,8	-0,8	-0,9	1,1
Greece	-1,9	-0,2	-0,4	-0,6	-0,7	0,0	-0,4	0,9	0,4	0,9
Hungary				3,2	0,1	-1,6	-0,7	-0,6	-1,7	-1,7
Ireland	0,0	0,0	0,0	0,0	0,0	2,4	-2,3	-0,7	0,5	-0,2
Iceland	-2,3	-2,3	-0,7	-0,9	-2,8	2,7	1,5	-0,9	7,6	0,6
Israel	1,6	-5,1	-0,3	0,9	-3,2	5,8	-0,2	-0,7	2,0	-0,9
Italy	-0,4	-1,9	-3,6	-3,9	-0,3	-2,6	-3,2	0,9	0,8	0,7
Japan	0,0	0,0	0,0	0,0	1,7	-1,3	1,9	3,0	-1,0	-1,8
Korea, Rep.	1,3	-3,4	-0,5	-0,4	-0,2	1,0	-0,6	-0,2	0,5	0,6
Lithuania				4,3	1,3	0,2	-1,1	1,2	-1,4	0,4
Luxembourg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Latvia				-15,2	-0,9	-1,8	1,6	0,4	1,2	1,7
Mexico	-0,6	-6,1	2,6	-2,6	0,4	0,8	-3,6	-0,2	-0,2	0,3
Netherlands	-0,1	-0,7	-0,9	-1,7	-0,1	-1,1	-0,6	0,2	-0,4	-0,2
Norway	1,9	-2,2	-3,3	-3,8	-5,3	-0,1	-2,4	-8,0	-2,1	-5,9
New Zealand	0,0	0,0	0,0	0,0	-0,9	-1,4	-0,2	6,0	-3,1	5,1
Poland				-0,9	0,7	0,4	-3,2	-0,9	-0,8	0,0
Portugal	6,8	-1,5	2,3	-4,5	-0,5	-0,3	0,2	0,0	0,2	0,1
Slovak Republic			0,0	0,5	0,2	-0,4	-0,3	-0,9	0,2	-0,3
Slovenia			0,0	-1,0	0,2	0,4	-1,8	-0,2	0,8	-0,8
Sweden	-1,8	-1,0	-3,5	-0,9	-3,7	1,4	1,5	-1,8	-10,8	-5,1
Türkiye	12,2	-3,6	-1,0	3,1	-2,3	0,6	-1,9	1,9	-1,7	3,7
United States	4,0	2,7	2,4	1,8	-2,8	1,0	-0,2	0,6	-1,3	2,5

Source: *World Bank (n.d.)*

Table 2 presents the ratio of NEO to gross domestic product (GDP). It is seen that countries generally have a low share when compared to GDP. When examining the table, it is observed that Latvia had higher rates by -11.3% in 1995, Switzerland by 7.9% in 2005, Denmark by 6.9% in 2010, Norway by 5.7% in 2015, and Sweden by -9% in 2020 compared to the general

average. Countries with balances ranging from 0 to 1 percent at all times are Australia, Colombia, Spain, Greece, Luxembourg, and the United States.

Table 2: *Net Errors and Omissions to GDP (%) of OECD Countries*

	1980	1985	1990	1995	2000	2005	2010	2015	2020	2022
Australia	0,0	0,0	0,5	0,0	0,2	0,2	0,1	-0,7	0,3	0,0
Austria	0,0	0,0	0,0	0,0	0,0	-1,8	-1,8	0,0	-1,6	-1,8
Belgium	0,0	0,0	0,0	0,0	0,0	0,6	-1,2	0,4	-0,1	-0,2
Canada	0,0	-1,1	-0,2	0,6	-0,6	-0,1	0,0	0,2	0,0	0,1
Switzerland	9,7	2,2	1,9	2,6	7,3	7,9	4,8	1,2	5,6	3,9
Chile	0,2	-0,4	-0,2	0,2	0,6	-0,8	-0,4	0,8	-1,1	0,6
Colombia	0,5	-0,8	0,1	-0,1	0,0	0,3	-0,3	0,2	0,4	0,2
Costa Rica	-1,4	3,7	0,7	0,9	1,3	-1,6	-1,3	-1,3	0,5	-0,1
Czechia			0,0	1,0	-0,5	-0,2	-0,5	1,2	-0,3	-0,1
Germany	0,2	0,5	1,1	-0,1	-0,6	-0,3	-2,2	-0,8	-1,1	2,2
Denmark	0,0	-0,5	1,7	0,6	2,7	0,9	6,9	2,0	1,6	3,4
Spain	-0,1	-1,0	0,1	-0,6	0,7	0,3	0,3	0,0	-0,4	0,5
Estonia				0,4	0,0	-0,3	0,1	0,8	0,0	-1,2
Finland	0,3	-0,1	-1,1	-1,0	-1,1	-2,1	0,5	0,7	-0,9	-1,3
France	0,3	0,1	0,0	-0,2	1,5	-0,5	0,8	0,4	-0,6	-0,5
United Kingdom	0,3	0,2	1,1	0,7	-0,3	-0,2	-1,1	-0,5	-0,5	0,7
Greece	-0,9	-0,1	-0,2	-0,2	-0,4	0,0	-0,2	0,6	0,3	1,0
Hungary				2,5	0,2	-2,1	-1,0	-1,1	-2,6	-3,1
Ireland	0,0	0,0	0,0	0,0	0,0	3,5	4,5	1,5	1,2	-0,5
Iceland	-1,6	-1,8	-0,4	-0,6	-2,0	1,9	1,4	-0,8	5,1	0,5
Israel				0,5	-2,2	4,6	-0,1	-0,4	1,0	-0,6
Italy	-0,2	-0,8	-1,3	-1,8	-0,1	-1,3	-1,7	0,5	0,4	0,5
Japan	0,0	0,0	0,0	0,0	0,3	-0,3	0,5	1,1	-0,3	-0,8
Korea, Rep.	0,9	-1,8	-0,3	-0,2	-0,1	0,7	-0,6	-0,1	0,4	0,5
Lithuania				3,7	1,1	0,2	-1,4	1,6	-2,0	0,7
Luxembourg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-0,1	0,0	0,0
Latvia				-11,3	-0,7	-1,8	1,7	0,5	1,5	2,6
Mexico	-0,1	-1,5	1,0	-1,1	0,2	0,4	-2,2	-0,1	-0,2	0,2
Netherlands	-0,1	-0,8	-0,9	-1,8	-0,1	-1,4	-0,7	0,3	-0,6	-0,4
Norway	1,5	1,7	2,3	2,6	4,0	0,0	1,7	5,7	1,4	4,9
New Zealand	0,0	0,0	0,0	0,0	0,6	0,8	-0,1	3,3	1,4	2,7
Poland			0,2	-0,4	0,4	0,3	-2,7	-0,8	-0,8	0,0
Portugal	3,7	-0,9	1,5	-2,7	-0,3	-0,2	0,1	0,0	0,2	0,1
Slovak Republic			0,0	0,6	0,2	0,6	-0,4	-1,7	0,4	-0,6
Slovenia				-0,9	0,2	0,5	-2,3	-0,3	1,2	-1,5
Sweden	-1,0	-0,7	-1,9	-0,6	-3,0	1,2	1,3	-1,5	-9,0	-5,2
Türkiye	2,1	1,2	0,3	1,4	1,0	0,3	0,9	1,0	1,0	3,0
United States	0,8	0,5	0,5	0,4	-0,7	0,3	0,0	0,2	-0,3	0,7

Source: *World Bank (n.d.)*

Figure 2 shows the share of the cumulative NEO in Turkey's GDP. This graph contributes to the evaluation of potential inconsistencies in the BoP (Siranova and Tiruneh, 2015). In Turkey, there is no continuity in the share of the cumulative NEO account within the GDP, and fluctuations are observed with both increases and decreases. The cumulative NEO account reached its highest values in 1984 by 4,8%, and then, in 1996 by 3,2%. On the other hand, it had notably low values in 1993 by 0,03%, and in 2015 by 0,1%. Starting at -0.3% in 2014, the negative percentages peaked at -1.5% in 2020. It is also thought that there is a relationship between crises in economies and the tendency for NEO to be negative (Çıplak, 2005; Özekicioğlu and Taştan, 2013; Çoban and Özel, 2014). According to the chart, it is possible that the negative value in 2002, 2010, and 2019 is related to the country's economic situation.

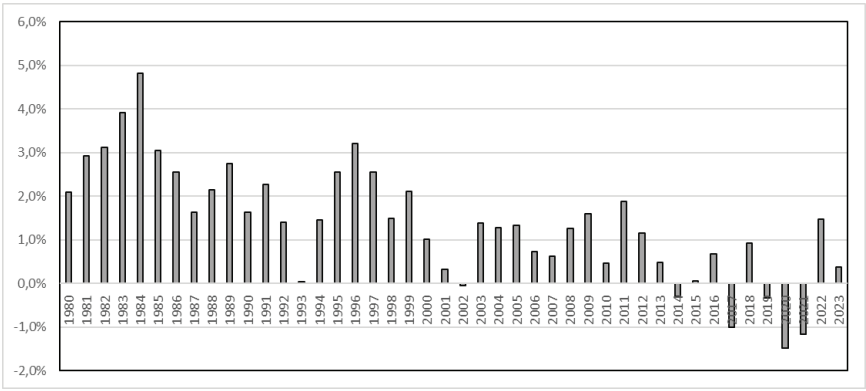

Figure 2: *The Ratio of the Cumulative Sum of NEO to GDP in Turkey*
Source: CBRT (n.d.) and World Bank (n.d.)

3. Literature Review

The literature review reveals relatively few studies on NEO. In time, the world has focused on this subject since 1971 when Duffy and Renton conducted a balancing item analysis of the United Kingdom. In Turkey, it has a similar development process as of the 2000s. Studies primarily focus on explaining the concept, followed by sustainability and influencing factors of BoP.

There are some studies explaining possible reasons for the surplus or deficit of the BoP for countries such as Sweden (Blomberg et al., 2003), Turkey (Çıplak, 2005), Croatia (Vuksic, 2009), Montenegro (Kilibarda, 2013), and lastly, Armenia (Barseghyan and Davtyan, 2018). Blomberg et al. (2003) emphasize that Sweden's NEO imbalance is closely related to the country's GDP and gross national income (GNI) reporting. In addition, it is mentioned that direct investments made by households abroad

should be included in the statistics. Also, Vuksic (2009) draws attention to the negative findings in the NEO account in Croatia between 1999 and 2007, especially in the third quarter of the year. It is concluded that this is based on the high correlation between the NEO account and tourism revenues. Barseghyan and Davtyan (2018) concluded that the national part of the imbalance in Armenia's NEO is based on FX cash movements, remittances, and outward investments. Çıplak (2005) discusses the NEO item and makes a comparison with selected countries. Accordingly, it has been concluded that NEO is largely attributable to the private sector and high numbers are not unique to Turkey.

IMF report states that it is difficult to identify the main determinants of the NEO (IMF, 2019). The study by Duffy and Renton (1971), one of the first examples in the literature, stands out for its use of a large number of variables. According to the results of the analyses, it was determined that the changes in the NEO were caused by errors in the recording of exports and short-term monetary transactions together with timing errors. Fausten and Brooks (1996) observed that exchange rate volatility, trade openness, and the ratio of total trade to GDP do not affect the NEO. Fausten and Pickett (2004) argue that financial sector transactions cause misreporting in the BoP. The imbalances in the NEO arise from financial sector transactions.

In Alagöz's (2014) study covering the years between 2002 and 2013, a causality relationship was found between the economic growth variable, which is one of the factors studied, and the NEO. In the study of Çoban and Özel (2014), it was determined that the changes in the export item between 2005 and 2012 were not in any relationship with economic growth, in other words, the increase in the NEO was not caused by exports. Keşap and Sandalcılar (2021) investigated the determinants of the NEO in Turkey between 2008 and 2020. The findings conclude that there is a cointegration relationship between the variables, and the most significant variable explaining the NEO account is the domestic residents' deposits abroad.

Şahin (2022) investigates the relationship between the NEO account and macroeconomic variables such as GDP and trade volume for the countries of Singapore, Malaysia, the United States, Uruguay, and the Philippines, covering the years 1980-2018. The study finds that trade volume negatively affects NEO, while GDP positively influences it. Yılmaz (2022) analyzes the factors affecting the NEO in the BoP between 1989 and 2020 in Turkey. According to the analysis results, no long-term relationship was found between suitcase trade, domestic residents' deposits abroad, and the NEO account. On the other hand, there is an inverse relationship between suitcase trade and NEO in the short term. Both in the long and

short term, a negative relationship exists between the USD/TRY exchange rate; meanwhile, a positive relationship has been found between interest rates, and the services account.

Emeç, Özdemir, and Kaplan (2023) analyzed the relationship between the NEO and the real effective exchange rate index. In this direction, analyses were conducted for three periods consisting of 2003-2010, 2010-2022, and 2003-2022 using monthly data for the period between 2003 and 2022. As a result of the analysis, it is determined that the NEO and the real effective exchange rate index do not move together in the long run. It is concluded that there is no consistent relationship between the real effective exchange rate index variable and the NEO variable since the causality test results differ between the periods, and some of the results obtained, although statistically significant, cannot be interpreted economically.

In terms of sustainability studies, the NEO account was found to be sustainable for G7 member countries (Tang, 2007), and also for five Asian countries including Singapore, Bangladesh, Indonesia, Korea, and Malaysia (Tang and Lau, 2008), and finally for nine member countries of the Organisation of the Islamic Conference such as Albania, Cote d'Ivoire, Indonesia, Kuwait, Malaysia, Mozambique, Pakistan, Tunisia, and Uganda (Tang and Lau, 2009). Furthermore, in the study by Mishra et al. (2008), the sustainability of Australia's NEO account from 1960 to 2006 was tested using an autoregressive unit root test. The study concluded that short-term volatility does not affect the reliability of long-term balancing item reporting, indicating that the balancing item remains sustainable over time. Emphasizing that the sample size of sustainability studies in the literature is insufficient, Ding and Tang (2019) tested the sustainability of the NEO item of 98 countries between 1966 and 2016 with both root tests and panel data analysis in a sample grouped according to different income levels. According to the results of the analysis, the NEO item was found to be sustainable for all countries.

The sustainability of BoP for Turkey was analyzed by Kula and Aslan (2010) using the Zivot-Andrews unit root test between 1950 and 2007 and by Özekicioğlu and Taştan (2013) using the LM unit root test between 1950 and 2012. Both studies concluded that the NEO account is sustainable. On the other hand, Taştan (2015) investigates the sustainability of the NEO for 33 OECD countries using the Fourier unit root test. As a result of the analysis, the account is found to be sustainable for Australia, Canada, Hungary, Norway, Switzerland, and the United States. However, NEO found it to not be sustainable for Turkey; it is emphasized that this may be due to the selection of different sample periods.

The fact that some transactions, such as the purchase or sale of products, and payments are made on different dates, strengthens the possibility that

payments may not end in balance. In Japan, it is concluded that the NEO is mainly due to timing errors in the recording of transactions (Tang, 2006). Finally, a few studies try to explore the connection between capital flight and the net errors and omissions literature (Cuddington, 1986; Yalta, 2009; Adetiloye, 2012; Siranova and Tiruneh, 2018).

4. Testing Sustainability of Net Errors and Omission

4.1. Conceptual Framework

As a result of the double-entry bookkeeping principle followed by BoP statistics, the sum of credit entries (C) should be equal to sum of debit entries (D), which indeed requires the difference in between credit and debit entries equal to zero. Such balance is presented by Equation 1.

$$C - D = 0 \quad (1)$$

If such balanced cannot be attained, there is a need for balancing item, called NEO, which is simply the difference between financial account and sum of current and capital accounts (IMF, 2009). NEO can also be defined as the difference between sum of credit and debit entries (Tang, 2007; Tang and Lau, 2008).

$$NEO = C - D \quad (2)$$

An increase in the size of NEO, whether positive or negative, can signal a serious systematic error, especially when the increase is persistent. Persistent increases in NEO may indicate economic instability and suggest the need for policy revisions or changes. Furthermore, a small NEO should not be considered an indicator of reliability, as BoP records can reflect small NEO values due to offsetting positive and negative errors. Therefore, instead of focusing on the size of the NEO, its sustainability (or stationarity) may be a more appropriate measure (Mishra et al., 2008). If the NEO is sustainable, the credit and debit entries in the BoP are expected to move together in the long run, thereby increasing the reliability of NEO statistics (Tang and Lau, 2008).

In order to test the sustainability of NEO (following Tang, 2007; Tang and Lau, 2008), the relation between C and D can be rewritten in linear regression equations as stated in equation 3 and 4.

$$C = aD + NEO \quad (3)$$
$$D = bC + NEO \quad (4)$$

In equations 3 and 4, a and b are assumed to be equal to 1 and NEO traded as error term. Under the condition of stationary NEO, the C and D would be cointegrated (Tang, 2007; Tang and Lau, 2008). Hence, by the use of unit root tests, sustainability of NEO can directly be tested (Taştan, 2015).

4.2. Data and Methodology

As mentioned in the preceding section, there are a limited number of studies focused on the sustainability of NEO. Among these studies, only five examine the sustainability of NEO for Türkiye. These studies have used either annual or quarterly data, with varying time spans. In this study, we employ both annual and quarterly data. The annual data covers the years from 1950 to 2023. The annual data for 1950-1983 is adopted from Çıplak (2005), while the data for 1984-2023 is downloaded from the Central Bank of the Republic of Türkiye's website. The quarterly data, covering the period from 1992 to 2023, is also sourced from the Central Bank of the Republic of Türkiye's website.

Several unit root tests have been proposed in the literature. Among these, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are the most well-known and popular. However, these tests have some drawbacks, such as not considering structural breaks in the data (Kula and Aslan, 2010), less accurateness in small sample size (Yıldırım, et. al. 2015). To overcome this drawback, some studies utilize the Zivot-Andrews or Lee-Strazicich tests, which account for structural breaks in the intercept, trend, or both. Furthermore, possible nonlinearity in the data can also be captured by the use of Fourier unit root tests (Taştan, 2015).

In this study, we first applied classical unit root test as Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowsky-Philips-Schmidt-Shin (KPSS). However, as these tests do not consider the existence of structural breaks, unit root tests for structural breaks Zivot-Andrews or Lee-Strazicich tests. Furthermore, possible non-linearity of the series has been tested by the use of Fourier ADF test proposed by Enders and Lee (2012). The technical details of those test are not presented in this study as are well documented in the literature.

4.3. Empirical Findings

Tables 3 through 6 present the findings of various unit root tests. Table 3 displays the results of classical unit root tests (ADF, PP, KPSS), with quarterly data results shown in Panel A and annual data results in Panel B.

Both the ADF and PP tests are used to determine the presence of a unit root in a time series. If the test statistic is less than the critical value (e.g., 5%), the null hypothesis is rejected, indicating that the time series is stationary. In contrast, the KPSS test has a null hypothesis that the time series is stationary. If the test statistic is less than the critical value (e.g., 5%), we fail to reject the null hypothesis, indicating that the time series is stationary.

Table 3: ADF – PP – KPSS Unit Root Tests Findings

Panel A - Quarterly						
	ADF		PP		KPSS	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Test Stat.	-10.2269	-10.1829	-10.5261	-10.4613	0.0464	0.0468
1%	-3.4824	-4.0319	-3.4825	-4.0319	0.7390	0.2160
5%	-2.8843	-3.4456	-2.8843	-3.4456	0.4630	0.1460
10%	-2.5790	-3.1477	-2.5790	-3.1478	0.3470	0.1190
Panel B - Annual						
	ADF		PP		KPSS	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Test Stat.	-6.4340	-6.3885	-24.4432	-23.0193	0.3074	0.3041
1%	-3.5402	-4.1130	-3.5229	-4.0887	0.7390	0.2160
5%	-2.9090	-3.4840	-2.9018	-3.4726	0.4630	0.1460
10%	-2.5922	-3.1701	-2.5882	-3.1635	0.3470	0.1190

ADF: Augmented Dickey-Fuller; PP: Phillips-Perron; KPSS: Kwiatkowsky-Philips-Schmidt-Shin

Panel A of Table 3 presents the findings for the quarterly NEO. The test statistics for the ADF test are -10.2269 and -10.1829, for models with constant and with constant-trend, respectively. As the test statistics are less than the critical values, the null hypothesis is rejected, indicating that time series do not have a unit root and the NEO is stationary. Similar result is also presented for PP test, where the test statistics (-10.5261, -10.4613) are less than the critical values, indicating the stationary property of NEO. The KPSS test statistics for the models with intercept and model with intercept-trend are 0.0464 and 0.0468, respectively, which are both less than the critical values. Hence, we fail to reject the null hypothesis, indicating that the time series is stationary.

Panel B of Table 3 presents the findings for annual NEO series. The test statistics for ADF test are -6.4340 and -6.3885; and PP test are -24.4432 and -23.0193 for PP test for models with intercept and with intercept -trend, respectively. As the test statistics are less than the critical values for both tests, the null hypothesis is rejected, indicating that time series do not have a unit root and the NEO is stationary. The KPSS test statistics for the models with intercept is 0.3074, which is less than the critical values, indicating that the time series is stationary. On the other hand, the model with intercept and trend has a test statistic of 0.3041 which is higher than the critical values. So that the null hypothesis is rejected, which indicates that the annual NEO series is not stationary. Having the 1st difference, annual NEO series found as stationary[1***].

1 The 1st difference of the annual NEO series found to be stationary. The test statistics 0.2067 (critical values 0.7390, 0.4630, 0.347 for 1%, 5% and 10% respectively) and 0.1407 (critical values 0.2160, 0.1460, 0.1190 for 1%, 5% and 10% respectively) for the model with constant and constant-trend.

Table 4: Zivot-Andrews Unit Root Test Findings

	Panel A - Quarterly			Panel B - Annual		
	MA	MB	MC	MA	MB	MC
Test Stat.	-7.7844	-7.5171	-7.9989	-9.2056	-8.2607	-9.4707
1%	-5.34	-4.80	-5.57	-5.34	-4.80	-5.57
5%	-4.93	-4.42	-5.08	-4.93	-4.42	-5.08
10%	-4.58	-4.11	-4.82	-4.58	-4.11	-4.82
Break	2012Q2	2017Q3	2012Q3	2012	1997	2012

MA: Change in intercept; MB: Change in slope; MC: Change in intercept and slope.

Table 4 presents the findings of Zivot – Andrews unit root test, which test the existence of unit root with one break for intercept (MA), trend (MB) and both (MC). As presented in Table 4, all test statistics are higher than the critical values for all models (MA, MB, MC) for both quarterly and annual series. Such finding indicates that the series are stationary with one break. Both quarterly and annual series point out 2012 under MA and MC. On the other hand, MB showed a break in 2017Q3 and 1997 for annual series.

Table 5: Lee-Strazicich Unit Root Test Findings

Panel A - Quarterly				
	MA - One Break	MA - Two Breaks	MC - One Break	MC - Two Breaks
Test Stat.	-9.5295	-9.3675	-8.0284	-9.5056
1%	-3.9993	-4.0975	-4.5474	-5.8042
5%	-3.3997	-3.5901	-3.9935	-5.2949
10%	-3.0898	-3.3388	-3.7144	-5.0297
Break	1995Q4	1995Q1/1995Q4	2020Q2	1995Q1/1997Q1
Panel B - Annual				
	MA - One Break	MA - Two Breaks	MC - One Break	MC - Two Breaks
Test Stat.	-2.1823	-6.0567	-5.1524	-11.1985
1%	-4.0840	-4.0730	-4.8004	-6.7500
5%	-3.4870	-3.5630	-4.2322	-6.1080
10%	-3.1850	-3.2960	-3.9411	-5.7790
Break	2010	2014/2016	2009	2009/2014

Lee-Strazicich unit root test findings are presented in Table 5. In panel A, where the quarterly NEO series analyzed, all test statistics are less than the critical values, which indicates that the annual NEO series are stationary with breaks, especially for 1995. Panel B of Table 5 presents the findings for annual series, where under all models annual NEO series found as stationary except MA with one break. The break dates are determined as 2010 and 2009 under MA and MC models with one break, respectively. MA model with two breaks point outs 2014 and 2016 as break dates, where 2009 and 2014 has been determined as break dates under MC model with two breaks.

As the classical test given above have some draw backs especially when non-linearites exists in the time series. In order to test possible non-linearity, we follow the steps defined in Enders and Lee (2012). In the first step, we estimate the frequency (k), which gives the lowest sum of squired errors and determine the optimum lag. In the second step, we pretested the nonlinearity by the use of Wald test.

Table 6: Wald Test for Non-Linearity

	Quarterly	**Annually**
k	5	5
lag	8	11
Test Stat.	2.8403	1.4964
1%	10.35	10.35
5%	7.58	7.58
10%	6.35	6.35

Table 6 presents the finding for Wald test for non-linearity. Optimum frequency estimated as 5 for both quarterly and annual data. Optimum lag has been estimated as 8 and 11 for quarterly and annual data, respectively. The test statistics has been compared with the critical values given Enders and Lee (2012, p. 197). As the value of test statistics less than the critical values under both quarterly and annual data, we fail to reject the null hypothesis of a linear trend. Such finding leads us to classical ADF test as recommended by Enders and Lee (2012).

5. Conclusion

Especially for the last decade the Turkish NEO data has been questioned from several perspectives. Such issue is also a trending topic in the international arena, as several studies are trying to explain possible causes of NEO and factors effecting NEO.

In this study, we explore the sustainability of Net Errors and Omissions (NEO) for Türkiye, employing annual data (1950-2023) and quarterly data (1992-2023) using various unit root tests. The findings from classical unit root tests, including the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests, indicate the sustainability of NEO for both annual and quarterly series, with the exception of the KPSS model with intercept and trend in the annual series. The Zivot-Andrews unit root test showed that both series are stationary with one break, indicating the sustainability of NEO. Similar findings were obtained with the Lee-Strazicich unit root test, except for the MA model with one break for the annual series. Following Enders and Lee (2012), we investigated the nonlinear properties of the NEO series but failed to reject

the null hypothesis of a linear trend, suggesting that classical unit root tests may be more appropriate. Overall, the findings of the study support the evidence of the sustainability of Türkiye's NEO.

Our findings are consistent with those of Kula and Aslan (2010), Özekicioğlu and Taştan (2013), and Ding and Tang (2018), but contradict those of Tang and Lau (2009) and Taştan (2015). Tang and Lau (2009) employed panel data unit root testing methods, and the methodological difference could be the source of the divergent findings. Taştan (2015) used one of the Fourier unit root testing methods, which can capture possible nonlinearity in the data. Our findings indicate that both annual and quarterly data do not exhibit Fourier-type nonlinearity. Such divergent findings can be explained by differences in the timespan of the analyses and recent revisions in the balance of payments statistics.

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Chapter 4

DETERMINATION OF FIRM-LEVEL VARIABLES AFFECTING FINANCIAL FLEXIBILITY: CASE OF BORSA ISTANBUL

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1. Introduction

Financial flexibility is the degree of the corporation's responsiveness to balance disruptions in the form of both size and timing (Abdioğlu and Aytekin 2016a). It refers to the abilities of firms to fend off surprise spending, grab investment chances, and manage emergent expenses (Gregory, 2020; Dalwai, 2023). Not just tied with this is the assessment of financial flexibility and holding of cash equal to financial leverage (Ma et al., 2015; King'wara, 2015; Chen et al., 2017). The introduction to financial flexibility came from Graham and Harvey (2001) regarding one essential determinant related to a firm's capital structure. Fundamental recommendations were directed at the investment budgeting process; also, the problem of cost of capital was under consideration along with corporate financing. They found that American CFOs put financial flexibility and credit rating agency services as the top valuation influence on stock prices at the time the securities are being offered along debt issuance and debt capital decision making. These features have in mind the study by Bancel and Mittoo (2004) for European firms, while Brounen et al. (2006) sampled 313 financial managers drawn from the United States, the Netherlands, Germany, and France. The result of the study once more confirmed the importance of target debt ratios following the trade-off theory. Also, they found that firms often sacrifice tax benefits purposely. Similarly, evidence from Stephan et al. (2008) demonstrates that among determinants shaping debt maturity structure for Ukrainian firms tax consequences, 'comfy' maturities, agency costs, liquidity, and signaling dominates the most.

The consideration of corporate finance is incomplete without the introduction of financial leverage. It is through borrowed funds that firms boost their investment returns. The inter-relation between financial flexibility and financial leverage has an all-important role and impact on a firm's decisions about its capital structure. A recent study has confirmed this proposition in supporting evidence when stating that the level of financial flexibility possessed by a company seemingly impacts its financial leverage ratio (Li et al., 2020). Consequently, companies with higher levels of financial flexibility may prefer lesser debt in their capital structures simply so that they maintain dexterity as well as reduce financial risk. This is unlike companies with less financial flexibility, which will carry higher financial leverage as a way of sustaining their operational activities or even growth effort. Such dynamic interaction between financial flexibility and financial leverage underlines the importance for a firm to understand how these factors interrelate and work towards shaping its financial strategy (Clark, 2010).

Debt maturity status of a company significantly affects the risk position and the financial soundness of a firm. Thus, it is vital to synchronize the

liquidity needs and operational flexibility with the maturity structure of the debt instruments. The association between financial flexibility and debt maturity is reasonably complex and needs sensitive handling. Debt level decisions in operational circumstances oppose theoretical viewpoints suggesting strategic equity/debt swelling substitution choices. This indicates the practical hurdles faced in trying to work out viable debt maturity profiles that would provide financial footing for day-to-day operational activities and growth ventures. Proper assessment of overall financial health and risk management strategies relating to debt maturity will only be possible if the influence of financial flexibility on corporate decisions relating to debt maturity is understood (Denis and McKeon, 2012).

Empirical studies provide an answer to the question of how much financial flexibility has affected firms' investment and financing decisions in real life. Therefore, empirical works try to reveal how an interaction effect founded between the real flexibility and financial one influences a firm's capital structure and financial performance. Real Flexibility and its Debt Financing. Real flexibility might not, therefore, be such an important determinant of capital structure. Some empirical analyses provide confirmation in support for this assertion. For example, Mackay (2003) suggested that real options such as flexibility in altering product offerings or production levels would affect a firm's debt capacity and its structure. The more flexible firms may have more alternative capital structure choices than the less flexible ones simply because they have more alternatives available to finance their operations and investments. It is important "to know from empirical studies the relation between financial flexibility and financial outcomes in practice" for practitioners and policymakers concerned with improving the financial standing of firms' and strategic decision making (Lindström and Heshmati, 2004).

The balance of financial flexibility, leverage, and debt maturity is a crucial aspect of corporate financing. Such inter-relations need to be carefully balanced by firms and hence optimize their capital structure as well as financial performance. Valuable insights can be drawn regarding how financial flexibility influences business strategic choices and long-run sustainability from empirical studies conducted on real-life scenarios. Thus, there is a greater need for businesses to be able to 'tame' the complexity the present-day financial environment entails. To this extent, understanding these dynamics and making appropriate decisions that enhance financial sustenance without necessarily jeopardizing other facets is all-important in today's financial setting.

The firm level determinants of financial flexibility were therefore considered within the perspective under consideration in this study.

A leverage ratio and a long-term debt ratio were used as independent variables in assessing this concern over financial flexibility. Model 1 comprised independent variables posed in the logarithm of total sales, market value to book value, tangible fixed assets/total assets, and ROE (return on assets). The leverage ratio, market to book value, asset maturity, logarithm of total sales, and the Piotroski F-score were the constituents of Model 2. The research was conducted over 188 companies representing the manufacturing sector that are listed on Borsa Istanbul, trading between 2018 and 2023. Such an analysis took into account the period of Covid-19 and considered the pre-Covid-19 and post-Covid-19 years in instituting a comparison between conditions. For this case, 2018 and 2019 are regarded as years before Covid-19; however, 2020 and 2021 make it the period of Covid-19 while 2022-2023 is considered post-Covid-19. Besides, there are limited numbers of studies about Turkish capital markets related to financial flexibility. Research on this subject is limited in quantity, and this study is original in terms of Covid-19 and the period being researched. As a result, it is anticipated to add to the literature in this regard.

This study, as follows, has five sections. The first section is the introduction; the second section reviews the literature; the data set and methodology are described in the third section and empirical findings are exposed in the fourth section; and findings are finally concluded with recommendations.

2. Literature Review

Financial flexibility has been widely researched in the international academic field with several factors such as equity investments, dividend payout ratios, capital structures, ownership structures, risk management, and performance and firm value. This section of the study will review existing literature on financial leverage and debt maturity, which are the variables under analysis.

Faulkender and Wang (2006) argue that, as a firm keeps more cash reserves, the value of "cash" itself declines. Other things being equal, firms prefer to unleash high financial leverage and prefer cash liquidation in the capital markets not just in the form of dividends but also as repos. A research by Fernando et al. (2014) points out a conservative financial leverage policy as an issue of small private firms which have limited credit options and weak investor bases. Low leverage modest and high cash Liping et al. (2013) have found that on the basis of listed Chinese companies, low leveraging, and high cash holding are variables that contribute to financial flexibility which further translates into better performance in a few years to come. Arslan-Ayaydin et al. (2014) study how financial flexibility affects investments and performance during the 1997-1998 Asian Crisis and the

2007-2009 Credit Crisis among East Asian firms. It concludes; hence, that financial flexibility among firms is achieved by relatively conservative leverage ratio policies and to a certain extent the amount of holding cash reserves. Abdioğlu and Aytekin (2016b) examine how financial flexibility influenced capital investments in manufacturing firms using a study sample drawn from firms traded on Borsa Istanbul during 2006-2011. This discussion sought to find out the factors that were affecting financial flexibility by examining the behavior of the selected manufacturing firms in the period of, and after, the 2008 economic recession. From this, they found out that those that had higher levels of internal financing had not earmarked much money for such investment since before the crisis. However, it was also found that flexible firms were better off than others during the time of crisis. They also found out that high leveraged companies increased their leverage ratios in and after the crisis; however, high cash companies found their cash ratios decreased because of the crisis. Thus, flexible companies did not have all of their investment-cash flow sensitivity benefits neutralized by the crisis, as shown by the smaller cutbacks in investment spending after the crisis.

Schoubben and Hulle (2011) state that this difference can be clearly observed when a firm is listed or unlisted, more evidently in general, such as when foreign sources are low and expected investment opportunities are good. Foreign sources cash flow expected investment opportunities much. Exchangelisting places some restrictions on equity financing flexibility. New common stock cannot be issued under conditions; operating costs could be covered or dividends to the shareholders may be made the reason for increased leveraging by making a debt issue that taps a source of financial flexibility severely. In contrast relates to findings of DeAngelo and DeAngelo (2007) and Denis and McKeon (2012). Marchica and Mura (2010) reciprocate this finding by stating that new investment projects in capital expenditures are related only to periods where low leverage ratios have been witnessed. Hence such a serpentining of investment, it appears that these expenses are taken care of through new issues of debt paper and hence a very indirect and rough measure but indicative of the direction that corporate size is positively correlated with financial slack. The opposite result, however, was found by Clark (2010) in his analysis of publicly traded companies in the United States between 1971 and 2006. He concluded that firms having a high marginal value were more inclined to issue equities as opposed to borrowing from the outside just out of risk hedging considerations. This information contravenes the popular financial "pecking order theory" for 'young and dynamic' companies. Although Morris (1992) posits that heavily leveraged companies prefer long-term maturities to stave off the inevitable default, Jun and Jen (2003),

and Adbioglu and Abdilogu (2017) discover that companies with short-term debt experience greater financial strength and flexibility. Leland and Toft (1996), Kim et al. (1995) find positive relations between leverage and maturity of debt. Antoniou et al. (2004) examine determinants of corporate debt maturity for French, German and British firms; they provide the first direct test of the pecking order across these three countries and support this argument with the liquidity risk case. Whited (1992) as well as Ozkan (2001) find a significant positive correlation between firm size and debt maturity. Emery (2001), Hart and Moore (1994), Graham, and Harvey (2001) are of the opinion that a relation exists between the asset type and debt type concerning maturity.

The financial flexibility theory was examined by Killi et al. (2011) in European publicly traded firms between 1998 and 2008. They found the more financial important firms maintained low leverage ratios, and the financial flexibility had a huge effect on leverage ratio. A similar low level of financial leverage among American firms was reported by Frank and Goyal (2009) for the period 1950–2003 within firms which are publicly traded and paying dividends. Byoun (2011) uncover that most underdeveloped companies exhibited low levels of leverage except for firms that had financial slack, young fast-growing companies whose ratios were moderated and mature companies in the recovery phase that had moderate ratios. Hess and Immenkötter (2014) go ahead to show a relation between financing policies and investment opportunities as well as the external debt funding source. Currently, it is the very fact 'borrowing in order to generate investment instead of borrowing for investment'. This supports the traditional point of view on capital structure, wherein companies would be said to have resorted to short-term borrowing to fund investments. Research by Rapp et al. (2014) find that shareholders value financial flexibility more than the imposition of low dividend taxes. They also preferred a stock dividend to a cash dividend for their investment in underlevered companies. These results help explain the unusually high levels of cash holding by firms. A different study was performed by Lindström and Heshmati (2004) on multinationally operating companies in the paper and paper products sector, for the period 1992 to 2002. Theirs was another finding which looks at the relation between investment as well as financing decisions and financial flexibility. They noticed that investment opportunities were decreasing on average but related to working capital, intangible assets, labor, growth, and indirect income (cash flow) used as investment proxies. Negative coefficients were also found on leverage and time and leverage and the set of short-term assets, tangible fixed assets, and non-debt tax shields.

On average, it can be said that different findings are received due to the differing variables and periods applied in the studies.

3. Material and Method

In this study, the determinants of firm-specific financial flexibility are investigated. Financial flexibility refers to a firm's ability to obtain and restructure financing at a reasonable cost. Firms with high financial flexibility can avoid financial distress during adverse events and quickly invest when profitable opportunities arise (Gamba and Triantis, 2008). In this context, manufacturing firms listed on Borsa Istanbul are examined between 2018 and 2023. Firms lacking data for at least one of the variables used in the analyses were excluded, resulting in a sample of 188 firms. The data are obtained from the Finnet Stock Expert portal.

Leverage ratio and debt maturity ratio are used as measures of flexibility. Firms with low leverage ratios and those with a higher proportion of long-term debt are considered to have high financial flexibility. The analyses consider the periods of pre-Covid-19, during Covid-19, and post-Covid-19. The years 2018 and 2019 are considered the pre-Covid-19 period, 2020 and 2021 are considered the Covid-19 period, and 2022-2023 are considered the post-Covid-19 period. Models for each of these three periods are estimated as follows:

$$Leverage = Size + MB + Tangibility + Profit \quad (1)$$

$$LTDebt = Leverage + MB + AssetMaturity + Size + Piotroski \quad (2)$$

Table 1 defines the variables used in the analyses. Additionally, the Piotroski F-score and asset maturity (AssetMaturity) variables are included as independent variables in the analyses. The AssetMaturity variable is calculated using the following equation:

Asset Maturity=(Tangible Assets/Total Assets)×(Tangible Assets/ Depreciation) + (Current Assets/ Total Assets) × (Current Assets/ Cost of Goods Sold)

Table 1. Definitions of Dependent and Independent Variables

Variable	Definition
Leverage	Total Debt/Total Assets
LTDebt	Long Term Debt/Total Debt
Size	Log (Total Sales)
MB	Market Value/Book Value
Tangibility	Tangible Assets/Total Assets
Profit	Return on Assets

The Piotroski F-score, introduced by Piotroski in 2000, is a measure that combines nine indicators, each of which can score either 0 or 1. These indicators assess various aspects of a firm's financial health. Four of these indicators evaluate profitability, three assess liquidity, and two measure operational efficiency. For each indicator, a score of 1 represents strength, while a score of 0 indicates weakness. The F-score is calculated by summing these indicators, resulting in a score ranging from 0 to 9. Higher scores indicate better financial performance or quality (Lalwani and Chakraborty, 2018). Nine criteria are used to calculate the Piotroski F-score, which are divided into three groups (He and Tan, 2022):

Profitability:

1. Return on Assets (ROA) (The F-score is assigned as 1 if ROA is positive, otherwise 0).

2. Operating Cash Flow (CFO) (If CFO is positive, the F-score is 1; otherwise, it is 0).

3. Change in ROA (If ΔROA is greater than zero, the F-score is 1; otherwise, the F-score is 0).

4. Accruals (If CFO is greater than ROA, the F-score is 1; otherwise, it is 0).

Leverage, Liquidity, and Equity Issuance:

1. Change in Leverage (long-term) (If the ratio decreases compared to the previous year, 1 point is assigned; if it remains the same or increases, 0 points are given).

2. Change in Current Ratio (If the ratio decreases compared to the previous year, 1 point is given; if it remains the same or increases, 0 points are given).

3. Change in Number of Shares (If no additional shares are issued, 1 point is assigned).

Operating Efficiency:

1. Change in Gross Margin (If a firm's F-score is 1, it means the current year's ratio is greater than the previous year's; otherwise, it is 0).

2. Change in Asset Turnover (If the current year's ratio is greater than the previous year's, the F-score is 1; otherwise, it is 0).

The study employs fixed effects and random effects panel data methods. The F-test is used to decide between the pooled Ordinary Least Squares (OLS) method and the fixed effects method. In all models, the F-test result is significant, leading to the choice of the fixed effects model over OLS. In

the second stage, the Breusch-Pagan Lagrange Multiplier test is used to choose between the random effects method and OLS. Based on the results of this test, the random effects method is preferred in all models. Finally, the Hausman test is conducted to determine whether random effects or fixed effects should be used. Based on this test, fixed effects are used in some regressions and random effects in others.

4. Empirical Results

Table 2 presents the descriptive statistics of the variables used in this study. Values during pre-Covid-19, during Covid-19, and post-Covid-19 periods are compared. The average value of the LTDebt variable is approximately 99% in all three periods. The leverage ratio is 44.84 post-Covid-19, compared to 56.86 pre-Covid-19, indicating a decline in leverage after Covid-19. During Covid-19, the leverage ratio (55.97) is similar to the pre-Covid-19 value. The MB variable shows nearly a twofold increase post-Covid-19. Among the three periods, it has the highest average during Covid-19, with a value of 6. The average of the AssetMaturity variable is close across all three periods. The average firm size rose from 19.70 pre-Covid-19 to 21.83 post-Covid-19. The average Piotroski F-score is around 5 in each period. An increase is observed in the Tangibility and Profit variables after Covid-19. In the analyses, the Size variable is used in logarithmic form, while other variables are used in their raw (ratio) form.

Table 2. Descriptive Statistics

Panel A: Pre-Covid-19

Variable	N	Mean	sd	p25	p50	p75
LTDebt	374	0.992847	0.001665	0.991661	0.992671	0.99387
Leverage	376	56.86346	30.38033	37.39936	59.1768	72.80522
MB	376	1.925	3.414913	0.608712	1.277919	2.269555
AssetMaturity	371	8.188673	18.68463	2.124234	3.868077	8.270826
Size	361	19.70489	1.895748	18.52022	19.72708	20.81103
Piotroski	376	5.159574	2.133183	4	5	7
Tangibility	376	44.17948	19.43819	30.45623	43.06457	57.85416
Profit	376	5.065953	12.11586	0	4.018362	9.858109

Panel B: Post-Covid-19

Variable	N	Mean	sd	p25	p50	p75
LTDebt	376	0.992555	0.001755	0.991293	0.992133	0.993626
Leverage	376	44.84286	18.51194	30.44144	44.12301	58.48882

MB	376	4.447696	19.04236	1.044888	1.720354	3.162488
AssetMaturity	373	8.429744	10.01183	2.600865	5.195846	10.68093
Size	368	21.82737	1.92943	20.52271	21.79201	22.9616
Piotroski	376	5.356383	1.511066	4	5	6
Tangibility	376	50.56636	18.35778	37.97206	50.0134	63.28791
Profit	376	6.265647	14.64057	-1.32435	5.745969	12.77512

Panel C: During Covid-19

Variable	N	Mean	sd	p25	p50	p75
LTDebt	375	0.992599	0.001651	0.991274	0.992371	0.993652
Leverage	376	55.97425	28.77092	36.59549	58.70498	72.47137
MB	376	6.007145	18.22179	1.58258	2.770884	5.200813
AssetMaturity	375	7.842494	12.63356	1.910877	3.894596	8.883638
Size	365	20.25729	1.85456	19.14754	20.20821	21.29491
Piotroski	376	5.577128	1.712513	4.5	6	7
Tangibility	376	41.63139	19.7188	27.21982	39.42189	55.6593
Profit	376	9.33771	16.01299	1.87345	6.716174	15.38594

Table 3 shows the Pearson correlation coefficients between the variables used in the analyses. No multicollinearity problem is observed between the variables. The leverage ratio is negatively correlated with the Tangibility and Profit variables. The LTDebt variable is positively correlated with the AssetMaturity and Piotroski variables, while it is negatively correlated with the Size variable.

Table 3. Correlation Coefficients

Değişken	LTDebt	Leverage	MB	AssetMaturity	Size	Piotroski	Tangibility	Profit
LTDebt	1							
Leverage	-0.0472	1						
MB	-0.0275	0.0459	1					
AssetMaturity	0.1338*	-0.0765*	-0.0412	1				
Size	-0.0917*	0.0347	-0.0363	-0.1706*	1			
Piotroski	0.1125*	-0.0599*	-0.0372	-0.0645*	0.1034*	1		
Tangibility	0.4493*	-0.1358*	-0.0859*	0.3366*	0.0115	0.0317	1	
Profit	-0.0521*	-0.3960*	-0.0503*	-0.0762*	0.1267*	0.3373*	-0.1831*	1

Note: '*' indicates a significance level of 1%.

Table 4 shows the analysis results for Model 1. The first column presents the pre-Covid-19 period, the second column the post-Covid-19 period, and the last column the Covid-19 period analysis results. The fixed effects

method was used for all three periods. The Tangibility and Profit variables negatively affect Leverage both in the pre-Covid-19 and post-Covid-19 periods. If firms with low leverage are considered to be more financially flexible, it can be concluded that flexible firms are more profitable and have a higher proportion of fixed assets. According to the Pecking Order Theory, profitable firms prefer internal financing before external sources. Therefore, there is a negative relationship between leverage and profitability (Titman and Wessels, 1988). Based on the results of this study, firms in the sample appear to follow this theory, and the Covid-19 period does not affect this negative relationship.

Firms with high fixed assets can create an increase in funds available for internal financing (to the detriment of external financing) because they set aside higher depreciation. Therefore, firms with a high fixed asset ratio tend to have lower leverage (Onofrei et al., 2015). This result is also unaffected by the Covid-19 period.

The Size variable has a statistically significant negative effect on Leverage only in the post-Covid-19 period, suggesting that larger firms are more flexible after Covid-19. Both the Pecking Order Theory and the Trade-Off Theory indicate a positive relationship between firm size and leverage. However, this study does not support these theories. This may be due to the rapidly rising inflation rates in Turkey after the Covid-19 period, which also drove up the costs of external financing. As a result, firms may have preferred to source financing from internal funds or equity markets instead of external sources, and the increase in the number of initial public offerings could be seen as a signal of this trend.

Table 4. Determinants of Leverage

Variable	**Leverage-PRE**	**Leverage-POST**	**Leverage-COVID**
MB	0,039 (0,171)	0,036 (0,032)	0,030 (0,044)
Tangibility	-0,0229 (0,094)**	-0,467 (0,097)***	-0,063 (0,110)
Profit	-0,737 (0,069)***	-0,092 (0,040)**	-0,123 (0,091)
Size	2,168 (2,238)	-8,954 (2,277)***	-0,886 (1,999)
Constant	28,136 (44,497)	264,337 (51,822)***	77,850 (41,627)
Fixed Effects	Yes	Yes	Yes
F-Test	F(4,175) = (29,32)***	F(4,179) = (8.35)***	F(4,178) = (0,92)***
LM-Test	chibar2(01) =(112,82)***	chibar2(01) =(103,51)***	chibar2(01) =(113,83)***
Hausman Test	Chi2(4)=(157,98)***	Chi2(4)=(30,86)***	Chi2(4)=(51,68)***

Note: '', '', and '' represent statistical significance at the 1%, 5%, and 10% levels, respectively. The values in parentheses are standard errors.

The long-term debt ratio is another variable that can be used as a measure of financial flexibility. Firms that use long-term debt are considered to be more flexible. Based on this, in the second model presented in Table 5, the LTDebt variable is used as the dependent variable. The first column presents the pre-Covid-19 period, the second column the post-Covid-19 period, and the last column the Covid-19 period analysis results. The random effects method is used in the first column, while the fixed effects method is used in the second and third columns.

A positive relationship is found between the AssetMaturity variable and the dependent variable in both the pre- and post-Covid-19 periods. It is concluded that firms with higher asset maturity are more flexible in both periods. The matching hypothesis suggests that the maturity of debt is positively related to the maturity of assets (Stohs and Mauer, 1996). Debt maturity should match asset maturity. If the debt maturity is shorter than the asset maturity, the firm may not have enough cash to pay off its debt (Stohs and Mayer, 1996, 285). Additionally, Chang (1989) find that matching maturities reduces the agency costs of debt financing. According to the analysis results of this study, the positive relationship between asset maturity and debt maturity is not affected by Covid-19.

Table 5. *Determinants of Debt Maturity*

Variable	**LTDebt-PRE**	**LTDebt -POST**	**LTDebt -COVID**
Leverage	0,00000399 (-0,00000345)	-0,00000664 (-0,00000532)	0,00000711 (-0,0000065)
MB	0,0000327 (-0,0000205)	0,00000673 (0,00000343)**	-0,00000195 (-0,00000371)
AssetMaturity	0,00000657 (0,00000401)*	0,00001550 (0,00000838)*	0,00001 (-0,00001)
Size	0,0000562 (-0,0000603)	-0,0002 (0,0000603)***	-0,0009 (0,0002)***
PİOTROSKİ	0,00005470 (0,0000327)*	0,0001 (0,0000417)***	0,0000858 (0,00003)**
Constant	0,991 (0,001)***	0,997 (0,001)***	1,01 (0,003)***
Fixed Effects	-	Yes	Yes
Random Effects	Yes	-	-
F-Test	F(5,173)= (0.92)***	F(5,176) = (6.14)***	F(5,177) = (9.37)***
LM-Test	chibar2(01) = (69.35)***	chibar2(01) = (82,76)***	chibar2(01) = (82,81)***
Hausman Test	Chi2(5)=5,15	Chi2(5)= (32,79)***	Chi2(5)= (39,85)***

Note: ', ', *and* ' represent statistical significance at the 1%, 5%, and 10% levels, respectively. The values in parentheses are standard errors.

The MB variable has a significant and positive effect only in the post-Covid-19 period. This result suggests that firms with growth opportunities are more flexible. This finding differs from the literature because, particularly after the Covid-19 period, the rapid increase in the number of investors entering Borsa Istanbul led to a sharp rise in the index, causing firms to become overvalued. Investors seeking to protect their savings against rising inflation increased trading volumes in Borsa Istanbul, and manufacturing companies that generated foreign currency through exports also saw their market values increase. However, according to Myers (1977), firms with high growth opportunities have shorter debt maturities. He explains this relationship by the high levels of underinvestment problems between shareholders and debt holders in firms with more growth options. Short-term debt is viewed as a solution to these issues.

In the post-Covid-19 and Covid-19 periods, larger firms are less flexible. In all three periods, a positive relationship was found between the Piotroski F-score and the dependent variable. It is concluded that financially healthy firms are less flexible and tend to use short-term debt. Flannery (1986) states that financially strong firms signal their quality to investors by choosing short-term debt. Therefore, financially strong firms are expected to prefer short-term debt. This result is not affected by the Covid-19 period.

5. Conclusions

In this study, leverage and long-term debt ratio variables are used as dependent variables in two separate models to explore the firm-level determinants of firms with high financial flexibility. Firms are low in leverage ratios and long in debt maturities. In fact flexible, in the first model it is observed that Covid-19 affected only the size variable. Large firms borrow less during the post-Covid-19 period; hence their financial flexibility increased. No significant relation is found in the pre-Covid period between these two variables. However, companies with high tangible fixed assets and high profitability index are both seen to be flexible in pre-and post-Covid periods.

In the second model, financial "healthy" companies are more flexible in all three periods. Specifically, larger companies are less flexible in and after Covid-19. It is also observed that asset maturity has a positively significant impact on flexibility in the pre-and post-periods of Covid-19 but not in the during period. It is as well proved that growth opportunity affected the firm to be more flexible in after the Covid-19 period.

It can be inferred that firm-specific variables affecting the leverage ratio and long-term debt ratio are different during and immediately after the crisis periods from the findings. Owing to the short duration

prescriptiveness of the study, that is, two years in each case, no highly econometrically sophisticated model has been deployed. This will be part of future research agenda issues, and as such, different models can be tried in the alterative sampling period.

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Chapter 5

THE RELATIONSHIP BETWEEN AGRICULTURAL LOANS AND AGRICULTURAL PRODUCTION: A LITERATURE REVIEW

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Introduction

Agricultural production is as old as human history and as important as human life. Humanity has demonstrated its importance by meeting the needs for agricultural production, food and clothing as a part of the struggle for survival since its existence. Under today's conditions, problems associated with the amount, quality and distribution of production have gained importance in the entire world as a response to the increasing population.

The importance of agricultural production will increase over time as long as humanity exists. Also to meeting basic needs such as food and clothing, agricultural activities also provide macro benefits as an input to other sectors, creating employment, and contributing to the economy over production and foreign trade. Despite this importance, developments in other sectors are ahead of the agricultural sector. In this context, agricultural sector must be modernized and restructured to maintain its strategic importance and the supply-demand balance.

The agricultural sector plays very important roles in the sociological and economic structure of Türkiye. Its place in the general socioeconomic structure of a country is determined by taking the following factors into account; its contribution to national income, the country's self-sufficiency in food products, its roles in imports and exports, its input to the industry, its share in employment, its power to create demand, etc.

As one of the basic elements of economic development, the increase in agricultural production depends on purposeful investments, implementation of technological innovations and continuous production with increased efficiency. Regarding the continuity of production in agriculture, one of the most important factors is financing. Manufacturers that do not have adequate capital try to provide working capital by using external sources to perform their activities on time and completely. In our present day, funds that are obtained through borrowing are generally provided by state-supported, organized and specialized loan institutions.

Agricultural loans support businesses when they are financially weak and lack liquidity, and help ensure the continuity of these businesses. The resent increase in agricultural production and agricultural loan use has aroused curiosity about what kind of relationship there is between these two variables. For this reason, the study aimed to determine whether there is a causality relationship between the use of agricultural loan and agricultural production, and if there is such a relationship, identify its direction, in other words, whether the use of agricultural loan triggers agricultural production or whether agricultural production triggers the use of agricultural loan.

Literature Review

In his study, Adams (1982) analyzed the agricultural loans used in low-income countries from the Second World War to the 1980s and summarized the problems of rural financial markets under 10 basic titles stating that loans provided to rural areas would have negative effects on income inequality and politicians should be aware of this. It was reported in a previous study that was conducted in India that a 10% increase in agricultural loans created a 0.2% increase in agricultural production in rural areas (Khandker and Bnswanger, 1989).

Bramna (1999) evaluated the risk-return effectiveness of loan policies in the Australian agricultural sector by using the Portfolio Theory Simulation Model in which the risk evaluation of loans was made by using a connection established between farm business debts and gross income. In this respect, it was concluded that the loan risk was 7.5% and above in 11 of the 42 industry-oriented areas. Mknelly and Dunford (1999) reported in their study that income increased where access to agricultural loans was provided and women's education level increased. In his study that investigated the socio-economic effects of loan use in rural areas, Gülçubuk (2000) found that 87.3% of the land-owning businesses in villages under the jurisdiction of TCZB, and 91.6% of the land-owning businesses in villages under the jurisdiction of TKK, received loans. He also reported that the use of loan in villages did not provide adequate efficiency for production. In this respect, it was found that the producers behaved as if they had receivables from the bank every year, and as a result, the use of loan became habitual, and especially, the necessary cost/profit analyzes were not made. In their study conducted on the relationship between agricultural loan and agricultural production in Pakistan, Iqbal et al. (2003) used the Least Squares Method. When they analyzed the data, a significant and positive relationship was detected between loan use and agricultural production.

In another study that was conducted in Poland (Petrick, 2004), the effects of government-supported loan access on the investment behaviors of farmers with loan cards were investigated empirically. It was concluded that investment volume had a negative relationship with farm size and that government policies that aimed to encourage productive investment should encourage large amounts of loans to all farms, regardless of their size. Mohan (2006) observed that agricultural loans had no effects on agricultural production in India. Miah et al. (2006) conducted a study in which they investigated the effects of agricultural loans of 120 rice producers in 2 districts in Bangladesh, and evaluated the loan requirement, usage pattern and repayment systems. They found that producers who used loan obtained 1.21-fold more rice yield than those who did not use loan. Guirkinger and Boucher (2006) uncovered the effects of loan restrictions

on agricultural productivity in regions that had weak insurance structures and developed a model to determine how all the negative impacts of loan restrictions had different effects on the productivity of agricultural business. They reported that loan restrictions had negative effects on the productivity of agricultural businesses in the northern regions of Peru, and agricultural performance could be achieved with strengthened legal financial institutions.

In their article, Yıldız and Oğuzhan (2007) analyzed the effects of monetary policies on agricultural production by using the VAR Model and the data from 1963-2004 in Türkiye. As a result of this study, it was found that agricultural loans were more important than other variables in solving the problems of the sector.

Sriram (2007) observed that loans that were provided to rural areas led to an increase in agricultural production in India. In their study, Asiedu and Fosu (2008) used the Logit Model Analysis to uncover the importance of agricultural loans in the Ghanaian economy between 1970 and 2003. They concluded that there was a decrease in the volume of loans in the agricultural sector during the study period, and this affected agricultural production negatively.

In his study conducted to investigate the roles of agricultural loan on the development of the agricultural sector in Poland, Tomasz (2008) found that agricultural loan had a positive effect on agricultural growth in two of the 16 regions in the country. Akram et al. (2008) conducted a study to investigate the effects of corporate loans on agricultural productivity, agricultural growth and poverty reduction in Pakistan. They found that agricultural loans had positive effects on agricultural production and had short- and long-term effects on reducing poverty. In a study conducted on India, Das, Senapati and John (2009) investigated the roles of direct and indirect agricultural loans in agricultural product production and loan payments within an econometric framework, considering the regional differences in agriculture. They reported that there were several gaps in the current institutional loan distribution system, such as inadequate loan provision to small farmers, medium and long-term loan inadequacy of agricultural loan providers, problems in transferring limited deposits in agriculture, and high dependence on loans given to the agricultural sector. They also concluded that agricultural loan played critical roles in supporting agricultural production.

In their study that investigated the effects of agricultural loans in rural areas of Pakistan, Khan et al. (2011) concluded that agricultural loan not only improved farming but also affected all sectors in the economy positively. In their study conducted to investigate the effects of agricultural loans on

agricultural production for Pakistan by using the data for the period 1972-2008, Sial et al. (2011) found a significant and positive relationship between agricultural loan and agricultural production.

Aksu (2012) conducted a Granger Causality Analysis study on Türkiye's data on agricultural loan sums, agricultural employment, agricultural sector exports and agricultural production totals in the quarterly periods between 2003 and 2011. As a result of his study, it was reported that agricultural employment and agricultural exports were the reason for agricultural loans. With this study, Aksu also reported that agricultural growth affected the agricultural loan market. Asghar and Chughtai (2012) investigated the effects of agricultural loan on wheat production efficiency. They analyzed the data with the "Cobb Douglas Production Function" in the SPSS program, and found that loans had significant and positive effects on wheat production. In a study conducted on Chile (Reyes et al., 2012), the factors that determined the productivity of fruit and vegetable growers and the effects of short-term loans on the agricultural productivity of market-oriented farmers were analyzed. As a result of the study, it was reported that although short-term loans did not affect agricultural productivity, education and activity type had significant effects on productivity and other loan providers (e.g., informal loan institutions) could relieve short-term loan restrictions in the Chilean rural financial market.

Obilor (2013) investigated the effects of agricultural loans provided by commercial banks, agricultural loan guarantee institution and government supports on agricultural production. As a result, he reported that the supports provided by the agricultural loan guarantee institution and the state made a positive contribution to agricultural production, but the effects of loans provided by other institutions on agricultural productivity were different. In his study, Gale (2013) concluded that stable production increase was achieved in agricultural supports after associating grain subsidy payments and price support in China with increases in farmers' production costs; however, despite the increase in direct payments, they had little effects on farmers' production decisions. Radović et al. (2013) conducted a study to investigate the effects of agricultural loans on agricultural production in Serbia and reported that an appropriate loan policy had positive effects on agricultural production.

In their study, Girabi and Mwakaje (2013) found that agricultural loans had positive effects on productivity in Tanzania because it provided access to inputs such as fertilizers, good seeds, etc. Mansouri, Samadi and Torkamani conducted a study in 2013 on the relationship between financial pressure and agricultural growth with an analysis by using time series data for 1962-2007 on the variables of agricultural GDP, inefficient public expenditures, human capital, industrial price indices, political instability

and financial pressure measures. As a result, they found that the control of bank reserve requirements, which is a reflection of financial pressure, had negative impacts on the economic growth of the agricultural sector, which shows that reducing the control over this parameter will help the government to achieve higher growth rates.

In their study conducted with 136 farmers, Ekwere and Edem (2014) investigated the effects of agricultural loans on agricultural production in the Etinan Region of Nigeria and found that agricultural loans had positive impacts on agricultural production. Chisasa and Makina (2015) conducted a study to investigate the relationship between agricultural loan and agricultural output for the period 1970-2011 in South Africa. They reported a significant and positive relationship between these two variables.

Sever and Han (2015) conducted a Granger Causality Analysis on the loans that were granted to the real sector and sectoral GDP data at a quarterly frequency between 2002 and 2012. As a result of their study, they reported that the loans used by the financial sector were the cause of agricultural GDP and the service sector GDP growth was the cause of the loans that were granted in this respect.

Isik et al. (2015) analyzed the effects of agricultural loans on agricultural production in 26 different regions in Türkiye with Panel Data Analysis by using data between 1995 and 2014. As a result, they reported that the effects of agricultural loans on agricultural production were positive in the short and long term.

Hartarska et al. (2015) investigated the relationship between agricultural loan and agricultural production in their study in which they investigated agricultural loan and economic growth in the Northeast, Lake States, Corn Belt, Northern Plains, Appalachia, Southeast, Delta States, Southern Plains, Mountain States and Pacific Regions in the USA for the period 1991-2010 and found a positive relationship. Misra et al. (2016) conducted a study and investigated the effects of agricultural loan use on agricultural production in the 14 most populous states of India for the period 2000-2012 and reported a significant and positive relationship between these two variables.

In the study that was conducted by Narayanan (2016), results were obtained showing that the inputs in agriculture such as fertilizer consumption and tractor purchases were quite sensitive to the increase in agricultural loans; however, the effects of agricultural loans on agricultural gross domestic product were weak. Adanacioglu et al. (2017: 195) investigated the agricultural production values, agricultural loan volumes, and loan performances of 81 cities in Türkiye along with the similarities and differences between the cities by using the Multidimensional Scaling Method. According to their results, it was found that the cities were

differentiated in terms of agricultural production values, agricultural loan amounts, and agricultural loan performance rates. The results showed the necessity of keeping some cities under the spotlight to ensure effective use of agricultural loans, and therefore, to improve agricultural loan performance. Mukasa et al. (2017) argued that agricultural production could increase by up to 60% by easing the agricultural loan restrictions in Ethiopia.

Gasques et al. (2017) found positive impacts of agricultural credit on agricultural GDP, reporting that a positive variation of 1% in agricultural credit generated a positive variation of 0.18% in agricultural GDP in Brazil.

Rad Tüzün and Aslan (2018) investigated the relationship between agricultural loan given to wheat, cotton and sugar beet producers and the cultivation areas of these products. As a result of their study, they concluded that these payments affected the production of some products positively, and the production of some products negatively. Koç et al. (2019) reported that a 1% increase in agricultural loans used in Türkiye provided an average increase of 0.17% in agricultural added value per hectare, and the direct effect and spillover effect was 0.12%.

Şaşmaz and Özel (2019) analyzed the effects of agricultural loans in Türkiye on the development of the agricultural sector for the period 1980-2016 in their analysis conducted by using the ARDL Method and the Cointegration Test depending on this method and Toda and Yamamoto (1995) Causality Test and concluded that agricultural loans had no effects in this respect. In their study conducted with 329 farmers in the Amhara Region of Ethiopia, Tesfaye and Worku (2019) reported a significant and positive relationship between the use of loans for irrigation purposes and agricultural production. In their study conducted to examine the relationship between agricultural production and a number of variables, including loan distribution, in Pakistan for the period 1978-2015, Rehman et al. (2019) reported a positive relationship between agricultural production and loan distribution.

Gebeyehu et al. (2019) conducted a study to investigate the corn production of a total of 260 farmers in Ethiopia where 140 farmers did not use loan and 120 farmers used loan, and reported that the use of loan caused a 26.6% increase in corn production. In their study, Tambi and Bime (2019) investigated the effects of adequate financial support on agricultural production for Cameroon. They concluded that adequate financial support had positive effects on agricultural production. Dogan et al. (2019) investigated the relationship between agricultural loans and agricultural growth for 81 cities in Türkiye between 2004 and 2017 by using the Panel Data Analysis Method. They reported that there was a long-term and significant relationship between the variables.

Tuan Anh et al. (2020) conducted a study to investigate the short and long-term effects of agricultural loans on agricultural production in Vietnam for the period between the 4th quarter of 2004 and the 4th quarter of 2016. They reported that agricultural loan affected agricultural production positively in both the short and long term. Seven and Tumen (2020) conducted a study covering 104 developed and developing countries for 24 years in the period 1991-2014 to investigate the relationship between agricultural loans and agricultural production. They found that the increase in agricultural loan led to an average increase of 4-5% in agricultural productivity and that this effect was higher in developing countries than in developed countries.

In their study in which Kadanalı and Kaya (2020) investigated the relationship between the agricultural production value and agricultural loans of Türkiye for the 2005-2018 period by using the Granger Causality Test, they concluded that there was a causality relationship from agricultural loans toward agricultural production. Nakazi and Sunday (2020) investigated the relationship between agricultural loans given by commercial banks and agricultural production in Uganda for the period between the 3rd Quarter of 2008 and the 4th Quarter of 2018. They reported that although agricultural loan had significant and positive effects on agricultural production in the long term, it had no effects in the short term. Sağdıç and Çakmak (2021) investigated the causality relationship of the agricultural support payments on agricultural outputs by using the quarterly data between 2006 and 2019 in Türkiye. As a result of the cointegration analysis, they found the existence of a long-term relationship between agricultural support payments and agricultural outputs. They reported that agricultural support payments had a long-term relationship with the level of agricultural production in Türkiye. They also argued that positive and negative shocks in agricultural support payments were associated with negative shocks in the level of agricultural outputs.

Uslu and Apaydın (2021) analyzed the effects of loan supports provided to the agricultural sector in Türkiye on agricultural productivity, production and agricultural areas empirically. They particularly examined the relationship between agricultural loan and agricultural productivity with econometric methods and the Driscoll-Kraay Estimator based on the panel dataset that covered 81 cities and the period 2002-2020. Their findings revealed that area-based loans affected agricultural production and agricultural areas negatively, and that the loans did not have any effects on agricultural productivity when recalculated in terms of dollars or purchasing power. Wanzala et al. (2021) found that agricultural loans had positive effects on coffee production in their study conducted with 174 coffee-producing farmers in the Kiambu Region of Kenya for the period

between 2017 and 2019. Semerci (2021) reported that a total of 258 billion TL loans were provided to 4.5 million producers in Türkiye through T.C. Ziraat Bank between 2010 and 2020. Agricultural loan usage status of the agricultural businesses was investigated for Türkiye by using the data obtained from 571 agricultural businesses in oil sunflower production, 136 businesses in cotton production, 83 businesses in canola production, and 74 businesses in rice plant production. According to the study, the businesses that used agricultural loan had differences compared to those that did not use agricultural loan by 1% in the businesses that produced oil sunflower in terms of the average number of years of education received by the producers, in the presence of the oil sunflower production area (da) by 1%, in the presence of cotton production area (da) by 1% in the businesses that produced cotton, and the efficiency values obtained from unit area also varied by 10%. Although the presence of canola production area (da) in canola producing businesses varied by 1% and the yield values obtained from unit area differed by 7%, it was found that the average number of years of education received by the producers in the rice producing businesses had a statistically significant difference by 2% when compared to other businesses. In their study in which Manoharan and Varkey (2021) investigated the effects of direct and indirect agricultural loans on agricultural production in the 2017-2018 period in the Indian states of Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal for the period between 1990 and 1991, they concluded that direct loans had positive effects on agricultural production, unlike the negative effects of indirect agricultural loans.

Gezer et al. (2022) investigated the effects of agricultural support and loans on agricultural production in their study that was conducted by using the ARDL Method for Türkiye for the period 2006-2021. In light of the findings they obtained at the end of their analyses, they reported that increases in agricultural support and agricultural loans affected production in the short term, but both positive and negative shocks of agricultural supports had negative outcomes such as reducing agricultural production in the long term. Although these findings showed that the positive effects of agricultural supports that increase agricultural production are not permanent, they also showed the deficiency in the agricultural system. In agricultural loans, it was found that although positive shocks increased production, negative shocks decreased production. As a result of their study, they reported that the effects of agricultural loans were more dominant when considering the effects of agricultural supports and loans on agricultural production. In their study conducted on farmers' access to loans in Ethiopia, Urago and Bozoğlu (2022) reported that the effects of

access to loans on agricultural productivity was positive and significant.

In their study that was conducted with 400 farmers who used agricultural loans in August and September 2020 in 3 regions of India, Yadav and Rao (2022) reported that the use of agricultural loans had significant and positive effects on agricultural production. In their study conducted to examine the effects of information and communication technologies on access to loans in rural China for 2016, Ma et al. (2022) reported that there was a positive relationship between agricultural loan and agricultural production.

In Oğul's (2022) study, the relationship between agricultural loans and agricultural production was investigated for the Turkish economy with annual data for the period 1990-2020. The cointegration relationship between agricultural loans and agricultural production was tested with the Johansen Cointegration Test. The coefficient estimation was made with FMOLS, DOLS, and CCR Methods, which are long-term coefficient estimators. The findings showed the presence of a cointegration relationship between agricultural loans and agricultural production. Also, the increase in agricultural loans also increased agricultural production in the relevant period in the Turkish economy, which shows that agricultural loans support agricultural production. Kaya and Kadanalı (2022) investigated the relationship between agricultural production and agricultural loans that were provided by development-investment and development banks in Türkiye for the first quarter of 2003 and the fourth quarter of 2008 by using Engle-Granger Two-Stage Cointegration, Toda-Yamamoto Causality, and DOLS Methods. They concluded that there was a cointegration relationship, causality relationship between agricultural loans and agricultural production and that agricultural loans had positive effects on agricultural production.

In the study that was conducted by Uygur and Kaya (2022), in which the cointegration relationship between agricultural loans and agricultural growth was investigated for Türkiye by using quarterly data of the period 2005:1-2021:4, evidence was found that there was a cointegration relationship between agricultural loans and agricultural growth. It was determined that the increase in agricultural loans provided by deposit and participation banks had positive effects on agricultural Gross Domestic Product in the long term. In their study that investigated the relationship between agricultural loans and grain production in the Sichuan Region of China for the period 1978-2018, He et al. (2022) reported that agricultural loan increased grain production, especially in the long term. Chandio et al. (2022) conducted a study to investigate the effects of climate and financial development variables on agricultural added value and grain production in Southeast Asian Countries for the period 1970-2016. They reported

that financial development affected agricultural added value and grain production in an inverted "U" shape.

Chandio et al. (2022) conducted a study to investigate the effects of R&D investments on grain production in China between 1990 and 2017 and reported that agricultural loan affected agricultural production positively.

In his study conducted on the relationship between agricultural loans and agricultural production in 53 countries for the period 2000-2018, Ozdemir (2023) found that there was a positive relationship between agricultural loans and agricultural production in the long term, and a 1% increase in agricultural loan caused a 0.19% increase in agricultural added value.

Mahapatra and Jena (2023) investigated the relationship between agricultural loans and agricultural production in grain, corn, and rice production in the Odisha Region of India for the period 2000-2020. Although they detected a positive relationship between agricultural loans and grain and rice production in the long term, they found that there was no significant relationship between agricultural loans and corn production.

Conclusion

The agricultural sector is a very important sector for people to sustain their lives. A large part of the foodstuffs and raw materials that people need to sustain their lives are supplied by the agricultural sector and there is no substitute for this sector.

Increasing the production capacity of agricultural enterprises at the point of agricultural production and thus ensuring continuity in agricultural production is possible by financially supporting agricultural producers in terms of resource and capital needs.

It is known that significant financial resources are needed for the restructuring of the agricultural sector. In terms of agricultural policies, agricultural production can be increased as a result of efforts to improve agricultural loans. Problems in the implementation of agricultural loans for producers should be examined and necessary conditions should be provided. Policies should be developed on producers' access to loans.

This study aims to present the main studies on the relationship between agricultural loan utilization and agricultural production and to fill the gap in this field to some extent.

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Chapter 6

EXPLORING THE INTERCONNECTION BETWEEN FINANCIAL INCLUSION AND CRYPTOCURRENCY OWNERSHIP: A SYSTEMATIC LITERATURE REVIEW

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1. Introduction

Developments in Fintech and decentralized platforms enhance the popularity of digital finance. Access to fundamental financial services may be still limited for people, especially in developing economies. Traditional finance seems to fall short of providing access to basic financial services such as bank accounts for transactions or credit purposes. On the other hand, cryptocurrencies provide a solution to financial inclusion of underbanked people through their decentralized nature via low cost, transparent channels. Consequences of the adoption of cryptocurrencies require more exploration even considering piling literature. This study aims to analyze the effects of cryptocurrency ownership on economic empowerment of underbanked populations through financial inclusion while keeping the record of challenges such as digital risks or requirement for regulation.

Several studies states that financial inclusion enhanced by adoption of cryptocurrencies via lowering transaction costs or increasing the financial accessibility for both SMEs ad individuals (El Hajj and Farran, 2024; Okeke et al., 2024). (Jegerson et al., 2024) address the importance of trust in institutions during cryptocurrency adoption process, also they stress the influence of strong governance on equitable adoption. (Alsaghir, 2023) and (Ozili, 2023) point out the risks involving lack of regulation and bariers to digital literacy.

The interplay between cryptocurrency and financial inclusion requires more attention. What is the enabling effect of financial inclusion on cryptocurrency adoption? Conversely, does low financial inclusion trigger cryptocurrency adoption for underbanked society? What is the role of electronic payment systems in this process? Furthermore, what is the mediating role of regulations and socioeconomic variables in the link between financial inclusion and cryptocurrency adoption? This chapter aims to fill the gap in literature by addressing these questions through a semi systematic literature review. Identifying recurring themes in the studies on financial inclusion and cryptocurrency adoption will help to understand influence of regulations and technology, also provide insights for policymakers. The goal of this study is to address crucial points and provide a foundation for further research through identifying the gaps in literature. Next section is providing an understanding on technology adoption and role of digital financial literacy in this adoption. The following section introduces the methodology of the study, and findings are reported in the fourth section. The last section is concluding the findings and addressing the gaps in the literature.

2. Theoretical Background

Financial ecosystems development is determined largely by digital technologies. Hence, the link between financial inclusion and cryptocurrency adoption poses a crucial subject to study. Access to fundamental financial services such as payment, basic credit products, saving accounts is defined as financial inclusion, which is essential for socio-economically equal opportunity growth environment.(Zaimovic et al., 2024) underline the important role of digital financial literacy to enhance financial inclusion. They point out that knowledge, behavior and attitude aspects of financial literacy boost financial inclusion. (Yadav & Banerji, 2024) also emphasizes the role of digital financial literacy in elevating financial resilience, increasing involvement in digital financial products and heighten informed decision making. They also point out the low level of general global digital financial literacy level. The transformative power of technological developments in digital financial tools is worth noting yet carefully curated strategies are needed to achieve higher level of digital financial literacy globally.

Decentralized, low cost and transparent solutions provided by blockchain and cryptocurrencies make a critical contribution to progressing financial inclusion. (Amnas et al., 2024) suggest that for underserved populations reaching financial services at affordable prices digital financial technology integration is crucial. (Kamble et al., 2024) discuss the pivotal role of blockchain technology in transparency and low transaction costs, hence the vital role for small and medium businesses and unbanked populations. Smooth incorporation of cryptocurrencies into payment systems easing the access to global markets and at the same time create less resistance in financial participation. Regardless of the potential of the cryptocurrency adoption, uncertainties and risks attached to cryptocurrencies stay viable.

Digital literacy, technological acceptance, and socio-economic factors are vital foundations for theoretical understanding of financial inclusion. (Amnas et al., 2024) discuss the Disruptive Innovation Theory and the Unified Theory of Acceptance and Use of Technology to explain the process of adopting and interacting with new financial technologies. They explain how people react when they are introduced to new technologies by these models. Digital maturity of the technology, perceived regulatory assistance, and trust in technology has a significant effect on the understanding and absorption of new technology and also has a significant effect on the impact of financial tools. (Kamble et al., 2024) accentuate the importance of demand side interventions. Increasing mobile technology penetration or enhancing financial literacy causes an increase in demand for higher financial inclusion.

Expansive results of cryptocurrency adoption and financial inclusion in socio-economic context compel the detailed analysis of the subject. Providing secure and efficient financial services to underserved populations bolsters these communities by increasing economic mobility and scaling down income inequality. (Zaimovic et al., 2024) and (Yadav & Banerji, 2024) both advocate the targeted educational programs and policies for fortifying financial digital literacy and decreasing the barriers to cryptocurrency adoption. Through a comprehensive approach it is aimed at allocating the benefits of digital financial development equally; hence, fortifying an inclusive and resilient global financial system. The interaction between cryptocurrency adoption and financial inclusion requires attention for both eliminating the risks and exploiting the benefits.

3. Methodology

A thematic analysis is conducted through a semi-systematic literature review with the purpose of investigating the relationship between financial inclusion and cryptocurrency ownership while extracting the relevant subthemes. Data extraction process provides a thematic review of the relevant literature on financial inclusion and cryptocurrency. (Braun & Clarke, 2008; Kraus et al., 2020; Xiao & Watson, 2017).

The review protocol developed by deciding search keywords, inclusion criteria and exclusion criteria. Web of Science database was used by search terms "Financial Inclusion" and "Cryptocurrency Ownership". The Boolean operator "OR" was used for searching digital "crypto investment behavior" OR "cryptocurrency". Only peer-reviewed journal articles are included. Furthermore, to ensure increasing relevancy unrelated areas such as "health" excluded.[1] The search resulted in 24 articles from the beginning number, 89 articles. Further screening was conducted by skimming the articles for relevance to the selected subjects. The inclusion and exclusion criteria listed below were applied.

Inclusion Criteria

- Studies that quantitatively or qualitatively explore the relationship between financial inclusion and cryptocurrency ownership.
- Empirical studies, theoretical models, and case studies.
- Papers discussing socio-economic factors influencing cryptocurrency adoption.

1 (All=(Financial İnclusion) And All=(Cryptocurrency Ownership Or Crypto İnvestment Behavior Or Cryptocurrency)) And ((Dt==("Artıcle") And Tasca==("Busıness Fınance" Or "Economıcs" Or "Busıness" Or "Management" Or "Socıal Scıences Interdıscıplınary" Or "Multıdıscıplınary Scıences" Or "Internatıonal Relatıons") And La==("Englısh")) Not (Sj==("Computer Scıence" Or "Scıence Technology Other Topıcs"))) And Social Sciences Citation Index (Sscı) Or Emerging Sources Citation Index (Escı) (Web Of Science Index)

Exclusion Criteria

- Studies focusing solely on technical aspects of cryptocurrencies without a connection to financial inclusion.
- Duplicates.

This step reveals that most of the articles on financial inclusion focus on the effects of mobile banking or fintech adoption on financial inclusion rather than the link between cryptocurrencies and financial inclusion. Another set of articles focuses on the portfolio diversification potential of cryptocurrencies. After eliminating for the subject relevancy 11 articles remain for data extraction and detailed thematic analysis. Further research for relevant articles conducted by google search and 3 more articles added to analysis. A total of 14 articles evaluated for main findings and themes, results are reported in Table-1.

4. Interconnection between Financial Inclusion and Cryptocurrency Ownership

Financial technologies (cryptocurrency, FinTech, CBDCs) are examined widely as tools for enhancing financial inclusion in developing markets in literature. Financial inclusion is linked to Cryptocurrency with anemphasis on how cryptocurrencies help the unbanked by reducing barriers to access (El Hajj & Farran, 2024; Njideka Ihuoma Okeke et al., 2024; Ozili, 2023). Table 1 summarizes the results of the literature survey by listing the main findings and themes in the literature on the link between financial inclusion and cryptocurrency along with the method utilized in th estudies. Detailed discussion of results for SMEs and individual adoption, digital risk, technological innovations, trust and regulatory needs is also provided folowing the summary of findings. This section concludes with the implacations on for policy, practice, and future research.

Table 1. Literature survey summary on the link between financial inclusion and cryptocurrency

Author/Year	Method and Data	Main Findings	Themes
(Allen et al., 2022)	Literature survey about fintech, CBDCs, and cryptocurrency regulations in China	China's fintech developments enhancing financial inclusion. CBDC provides an opportunity for global adoption.	Fintech adoption, CBDC implementation, cryptocurrency regulation.
(Makarov & Arzhevitin, 2022)	Theoretical analysis e-Hryvnia effects on Ukraine's monetary policy.	Virtual assets strengthen financial inclusion with risks. e-Hryvnia could enhance monetary transmission.	Virtual assets, monetary policy, financial stability.

(Catalini et al., 2022)	Analyzing stablecoins and regulatory impacts with trade-offs.	Stablecoins can increase financial inclusion. On the other hand, there are regulatory and design challenges.	Stablecoin design, regulatory trade-offs, financial inclusion.
(Hajr et al., 2023)	Survey on Bitcoin's e-commerce impact in Saudi Arabia.	Bitcoin adoption has significant effect on e-commerce in Saudi Arabia.	Bitcoin adoption, e-commerce integration, digital transformation.
(Alsaghir, 2023)	Narrative review with thematic analysis on digital risks in Islamic finance. (Shariah compliance)	Lists the risks of FinTech adoption in Islamic finance, pointing out fraud and operational vulnerabilities.	Digital risks, Islamic finance, Shariah compliance, FinTech adoption challenges.
(Temperini & Corsi, 2023)	Critical review of cryptocurrencies	CBDCs are effective for democratizing money, increasing inclusion mediated by CB roles	Cryptocurrency categories, democratization of money, financial inclusion.
(Jegerson et al., 2023)	Survey-based structural model 270 responses Analyzing determinants of cryptocurrency adoption in UAE.	Performance expectations and facilitating conditions are key for adoption.	Technology adoption, financial inclusion, structural barriers.
(Ozili, 2023)	Critical discourse on FinTech, CBDC, and cryptocurrency	FinTech and CBDCs promote inclusion and financial stability. Cryptocurrencies involve risks hence regulation is required.	CBDC, cryptocurrency risks, financial inclusion, regulatory, financial stability.
(Dong et al., 2024)	Probit regression for macroeconomic factors influence CBDC adoption in 85 countries.	Financial inclusion, remittances, and income has positive impact on CBDC adoption likelihood.	Macroeconomic determinants, CBDC adoption, financial inclusion.
(Jegerson et al., 2024)	Survey 270 responses	Consumer innovation has a mediating effect on perceived risk and adoption intentions. Also, financial inclusion emphasized	Cryptocurrency adoption, remittance efficiency, financial inclusion.
(Ha & Nguyen, 2024)	Survey of 1288 participants in Vietnam logistic regression	Fintech adoption and financial literacy has a positive impact on financial inclusion	Fintech, financial literacy, gender equality, rural-urban inclusion.
(Abdurrahaman et al., 2024)	Survey of 417 participants in Nigeria SEM	Trust and emotional value are driving factors for adoption	Socio-psychological factors, cryptocurrency trust, financial inclusion.
(El Hajj & Farran, 2024)	SEM on financial inclusion and economic empowerment with survey data.	Cryptocurrencies have a positive effect on financial inclusion. Trust has a positive impact	Cryptocurrency adoption, financial inclusion, trust, economic empowerment, digital literacy barriers.
(Njideka Ihuoma Okeke et al., 2024)	Literature survey on cryptocurrency adoption in SMEs	Cryptocurrencies enhance financial inclusion and innovation for SMEs via low costs, high transparency, and financial access.	SME innovation, financial inclusion, regulatory challenges, blockchain applications.

Almost all studies recognize technology (FinTech, cryptocurrency, CBDC) to improve access to financial services. However, the level of impact varies by region and regulatory readiness. CBDC (Central Bank Digital Currency) offers potential for inclusive financial systems, especially in underbanked regions. Regulatory gaps and financial instability are widely mentioned topics as digital risk of cryptocurrency. Furthermore, the impact of digital finance and enhancing financial literacy on entrepreneurial possibilities and economic resilience can be categorized as economic empowerment effect of digital financial inclusion. Balancing innovation with safety and trust in institutions occurs as a central requirement for the adoption of cryptocurrencies.

Several studies analyze the effect of cryptocurrency adoption on both individuals and SMEs. Both (Jegerson et al., 2023) and (El Hajj & Farran, 2024) emphasize the trust in institutions and ease of technology as determinants of adoption level. Also, they underline the increasing financial empowerment through financial inclusion by the adoption of cryptocurrencies. In comparison to traditional banking through cryptocurrencies offer alternatives for unbanked society not only for individuals but also for small and medium firms through credit and payment options. (Njideka Ihuoma Okeke et al., 2024) illustrate the impact of cryptocurrencies by increasing operational efficiency, curtailing transaction costs for businesses. Through access to global financial markets for SMEs, adoption of financial technology brings about economic growth. Despite the benefits of the financial technological adoption, there exist substantial challenges. High volatility in crypto markets, security concerns, under regulation and trust issues are financial risks associated with cryptocurrency adoption. These risks create barriers for adoption, to eliminate these risks sturdy governance structures and strategically designed educational programs are required.

(Njideka Ihuoma Okeke et al., 2024) list several benefits of cryptocurrency adoption for SMEs along with challenges, emphasizing the extraordinary prospects for SMEs which are not available through traditional financial channels. They point out the possibility of faster and low-cost global transactions through cryptocurrencies enabled by the decentralized nature of blockchain technology. Utilizing cryptocurrencies for trade removes the necessity for intermediaries. Also, decreasing transaction costs and postpones in transactions eliminate another invisible barrier for SMEs in the international arena. Furthermore, transparent structure of cryptocurrencies elevates the trust between parties and increases the credibility of SMEs in international markets. (Njideka Ihuoma Okeke et al., 2024) also mention more indirect benefits of cryptocurrency adoption such as elevation of operational efficiency along

with the innovation possibilities in business models. With the adoption of new technology SMEs become more proactive, capable and resilient in a digital business environment. Considering all these benefits they state cryptocurrencies has a transformative role for SMEs by facilitating financial inclusion and providing opportunities for growth.

Advancing landscape of the digital era of finance provides several opportunities to individuals and businesses along with challenges of digital risks such as lack of regulations and financial instability. Several studies draw attention to the need for comprehensive regulations for handling the digital risks attached to the digital transformation in finance while boosting the sustainable innovative environment. These regulations are necessary to establish public trust and ensure the safety of financial ecosystem. (Alsaghir, 2023) points out that to eliminate the fraud in Islamic finance there is a need for Shariah compliance. Also, compliance may ensure to diminish operational vulnerabilities and ambiguity attached to pioneering technologies. (Ozili, 2023) studies the balance between financial innovations and risks attached to unregulated financial instruments. Misuse of these instruments may jeopardize financial stability. (El Hajj & Farran, 2024) and (Abdurrahaman et al., 2024) suggest the implementation of sturdy regulatory frameworks for guaranteeing safety in adoption process of digital financial technologies. Also, regulations may ensure the imbalances between regions and enhance financial equality.

Increased transparency, higher operational efficiency, enabling seamless cross-border transactions and cost effectiveness are the transforming impacts of financial technological adoptions, listed by several studies. These qualities make blockchain technology and innovations come with this technology crucial for SMEs to catch the trends in global markets. Furthermore, these technological innovations have a transformative power on traditional financial services by increasing financial inclusion for underserved population ((Allen et al., 2022; Dong et al., 2024; Ha & Nguyen, 2024; Njideka Ihuoma Okeke et al., 2024). (Ha & Nguyen, 2024) shows how fintech platforms empowers unbaked population by increasing financial literacy. These studies reveal that developments in the financial technological arena fosters financial ecosystems for both individuals and firms by democratizing accessibility to the system and boosting economic growth.

Technological advancements in digital finance enhance resilience by increasing financial literacy during crises periods. Democratization of financial services for underserved communities and SMEs bolsters the innovation and increases the competitiveness of SMEs in developing economies in global markets. (Ha & Nguyen, 2024) illustrates the effects of financial literacy along with digital finance facilities on financial resilience

during global pandemic. During economic disturbances through the use of digital financial solutions, populations in emerging economies have access to financial services, hence maintain financial stability and navigate better in a distressed financial environment.

(El Hajj & Farran, 2024) utilize Structural Equation Modeling for analyzing the effect of cryptocurrency adoption on financial inclusion in emerging economies. They provide evidence for the enhancing effect of cryptocurrencies on user satisfaction, trust level in financial institutions and economic prospects for underserved population. (Njideka Ihuoma Okeke et al., 2024) study the consequences of cryptocurrency adoption for SMEs. They stress the importance of cost reduction, transparent transactions and access to global markets, along with the requirement for regulations. (Alsaghir, 2023) investigates the pros and cons of financial technology adoption in Islamic finance by utilizing a thematic analysis. The study emphasizes the importance of sturdy regulations to prevent fraudulent practices and mitigating the risks to ensure compliant implementation of technological innovations. (Ozili, 2023) implements discourse analysis for determination of the impact of CBDCs and cryptocurrencies on financial inclusion and financial stability. The study suggests that besides the transformative potential of cryptocurrencies, one should be aware of risk of instability and misconduct, hence the study emphasizes the importance of balanced regulations.

One of the crucial requirements for the successful adoption of financial technologies is trust in financial institutions. (Jegerson et al., 2023) underscore the importance of trust in the perception of security and credibility in digital financial tools. Trust has significant effect on user behavior and consumer innovations increase the inclination towards cryptocurrencies for transactional purposes. (El Hajj & Farran, 2024) highlight the role of trust in institutions and transparent implementation of technologies for elevating financial inclusion and boosting economic growth. User-friendly financial platforms, robust governance structures and transparency in transactions help to build trust in financial institutions through boosting user confidence; that leads to increased access to financial services, lower technical barriers and lower uncertainty and fraud. These precautions enable successful transitions of digital financial technologies and boost sustainability in the long-term.

Diverse implications of cryptocurrency adoption and financial technologies exist in policy, practice future research possibilities. Semi systematic literature review exhibits the dire need for well-structured regulations to support the innovations while maintaining financial stability. Detailed regulatory frameworks make it possible to prevent fraudulent practices, eliminate the digital risks and provide stability for

financial ecosystems. Implementing financial technologies to business practices provides several possibilities for both governments and firms as heightened financial inclusion and bolstered economic growth considering especially demolishing barriers for unbanked populations and SMEs. Future research possibilities consist of long run effects of Central Bank Digital Currencies, regional effects of financial technology adoption and its impact on economic advancements, and sectoral investigation of adoption process. Transformative effect of cryptocurrencies on economic outlook, emerging industries such as decentralized storage solutions or utilization of blockchain for supply chain management, and financial wellbeing is well documented through literature yet still requires higher concentration on field.

5. Concluding Remarks

Underserved and unbanked individuals suffer from lack of accessibility to financial services. This study investigates the link between financial inclusion and cryptocurrency ownership by utilizing a semi systematic literature review. Reshaping effects of digital financial innovations on financial inclusion provide solutions to masses with low financial accessibility. Furthermore, through this adoption process the role of policy makers and institutions is crucial to successful transformation through strong regulations. Findings suggest that fintech service suppliers should provide tailored products for individual needs while addressing trust issues of users. Implications for states are concentrated on the regulations and implementation of Central Bank Digital Currencies. CBDCs support the financial inclusion efforts providing guidelines for regulations. In welfare terms cryptocurrency adoption fosters financial access through payment, credit, insurance and saving tools, which lead to a decline in inequality in financial services and increase in financial mobility.

Undeniable growth in the interest in the link between financial inclusion and cryptocurrency ownership requires more dedication on several aspects of the topic. One of the research gaps in literature is the dire need for comparative analysis across countries for digital transformation requirements along with interdisciplinary perspectives. Regional differences are under examined, most studies about digital transformation concentrated on developed economies. Another important topic is the bidirectional relation between financial inclusion and cryptocurrency adoption. Cryptocurrencies enabling the financial inclusion for underserved communities is one side of the coin, the other side of the coin is financial inclusion boosting the cryptocurrency ownership.

Several variables may pose important information in the relation between financial inclusion and cryptocurrency ownership. Demographic

and socio-economic factors require more attention in future studies because of their potential mediating effect on the cryptocurrency adoption and impacts on financial inclusion. Additionally, digital financial literacy is reported as an important mediator, mechanism of the impact of financial literacy requires more attention. Furthermore, longitudinal studies may serve to understand the impact digital payment systems have on the adoption process of cryptocurrencies and their effect on financial inclusion.

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Chapter 7

EXAMINATION OF FINANCIAL BEHAVIOUR OF INVESTORS ACCORDING TO THEIR DEMOGRAPHIC CHARACTERISTICS[1]

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INTRODUCTION

The technology-based transformation of global competitive conditions and its increasing intensity lead to diverse attitudes exhibited by all entities, organizations, institutions, and individuals making investment decisions, ranging from multinational corporations to the smallest individual investors. One of the most significant commercial concerns of companies is to identify and acquire financial resources in the most acceptable manner. However, the changing competitive conditions necessitate not only the effort to identify the financial source of businesses but also the effort to prevent the loss of existing financial resources and bring them to the expected level of value.

Different approaches have been used from the past to the present for the successful management of financial resources. Investor behaviors, which were attempted to be explained with basic economic theories, have given way to the discipline of behavioral finance with the change in the perspective on humans over time. Notably psychology-based studies, which accept the psychological structures of individuals within the social structure and also deal with the psychological factors that constitute the social structure, affect and contribute other disciplines.

The discipline of behavioral finance, by contrast with the general economic theories that consider individuals as "rational beings", argues that individuals can only act with limited rationality when making investment decisions. Simon (1955), who introduced the concept of "bounded rationality", claims that individuals cannot make decisions rationally just based on numerical values, and that individuals' psychological and sociological conditions play an effective role in their decisions. Behavioral finance has also undergone changes in line with this, considering psychological effects to be decisive in investor behavior, and it is approached with traditional behavioral economics (Simon, 1955; Kahneman and Tversky, 1979) arguing that psychological factors are important but not decisive, and with new behavioral economics (Camerer, 1999) suggesting that they do not play a determining factor.

1.CONCEPTUAL FRAMEWORK

Especially with the transition to the behavioral finance school, the impact of different perspectives brought to previous approaches accepted as absolute truth, the conceptual framework of behavioral finance, its historical development, and its relationships with other disciplines it interacts with have been clarified. In addition, behavioral finance theories presented in the literature have been explained, and an attempt has been made to explain the existence of the relationship between individuals' psychological attitudes and theories upon which the study is based.

1.1. Behavioural Finance

When examining studies in the field of finance, it is seen that throughout the historical process, this discipline has been approached and studied from different perspectives. Traditional approaches consider individuals as mechanical beings and argue that their emotions will not be effective in the decisions they make. However, in behavioral finance studies, an individual is considered as an emotional and social being. As a social and emotional being, an individual's emotional state, along with their social environment, has an inevitable impact on their financial decisions.

1.2. Factors Affecting Financial Decision-Making and Investment Decisions

Decision making process is analyzed from a various disciplines in business. The decision-making and decision-making process is evaluated in the context of the discipline it is being addressed. Financial decisions arise as individuals, organizations, and countries strive to evaluate their existing resources using different investment instruments to prevent their assets from losing value and to achieve value gains. The tendency for financial decision-making is fundamentally based on two theoretical approaches. The first of these approaches is advocated by Schmalenbach and Le Coutre, focusing on increasing assets in the balance sheets of businesses and the relationship between assets and investments. The other approach, maintained by J.M. Schneider and Richti, is the approach of transforming investments into production elements to gain value (Tatar, 1993: 4). Financial investments are classified into different categories based on transaction volumes. Individual investors emerge as investors who carry out financial transactions on a small scale and make decisions based on their subjective opinions (Karan, 2001: 687). Individual investors exhibit different characteristics from the investment decisions of businesses and institutions when making financial investment decisions and act based on their knowledge and experiences that influence investment decisions (Küden, 2014: 30).

Even though investments may vary, individual investors exhibit similar characteristics to the approaches taken by institutions. This similarity is primarily based on the risk-investment relationship. Within this relationship, investors aim for low risk and high return (Jones, 1999: 19). Individual investors, who play a significant role in financial markets, receive the returns on their investments as a result of the transactions they conduct on their own behalf. There are differences between the decision-making processes of investments made at the individual level and the investment decisions of businesses investing at the institutional level. Therefore, it is crucial to identify the factors that affect the decision-making processes

of individual investors and determine their relationship with investment decisions. Starting from this point, it is necessary to identify the factors influencing individual investors' investment decisions and raise awareness among individuals.

Various studies address the factors that influence individual investors' financial decisions. The literature review reveals the following factors that affect individual investors' financial investment decisions:

- Individual factors
- Financial and economic factors
- Environmental factors

These factors influencing individual investors' financial decision-making behavior also consist of sub-factors. These factors are presented in subheadings below.

1.2.1. Individual Factors

Investments made by individuals, who are considered to have bounded rationality, naturally create differences based on the basic characteristics that a person possesses. When it is accepted that personal characteristics play an active role in individuals' decision-making processes, it is understood that they also play an active role in financial investment decisions.The personal characteristics that influence individual investors' financial investment decisions are examined under different headings. Ayvalı (2014: 50) classifies personality factors that affect financial decisions as age and health level, profession and income level, knowledge level and available time, general personality traits. Caner (2019) categorizes personality factors as knowledge, psychological elements, demographic characteristics, financial analysis, risk preferences of individuals. Güleç (2019) sorts out personality factors as the available time and knowledge level, the individual's health and age, the individual's lifestyle and expectations from life, the individual's income level and profession. Böyükaslan (2012) classifies personality factors as the individual's age, gender, education level, knowledge level and available time, income level and profession of the individual, the individual's personality traits and mental state.

Considering the classifications of personality factors made in various studies mentioned above, the personality factors that influence individuals' financial decisions include *the gender of the financial decision-maker, the age of the financial decision-maker, the education and knowledge level of the financial decision-maker, the profession and income level of the financial decision-maker, and the risk preferences and expectations of the financial decision-maker*. These factors are briefly explained in the following headings.

1.2.1.1.Financial Decision Maker's Gender

It is considered that decisions made by individuals may vary depending on their gender, and they may change their decisions bearing in mind the risk factor in those decisions. In terms of gender differences, it is known that women take fewer risks than men in situations such as using alcohol abuse and drug use, driving, gambling, etc. (Harranta and Vaillant, 2008: 396). Tekin (2019: 279) explains women's tendency to avoid risk in their financial investment decisions by attributing it to their emotional nature, while men's greater inclination to take risks in their investment decisions is attributed to their aggressive nature. Grable and Lytton (1998: 68) express that considering gender-based risk tolerance, men have a higher tolerance for risk compared to women, and male investors adopt riskier approaches in their investments. Gender differences also lead to potential losses in financial decisions. When examining these differences, it is observed that women tend to choose investment options with lower risk, while men are more willing to incur higher losses when the potential return is high (Olsen and Cox, 2002). Additionally, in the process of financial decision-making, gender plays a decisive role in the differentiation of financial investment instruments chosen by investors (Vyas, 2007: 55). Considering the impact of the gender factor on individuals' investment decisions, it is evaluated that this factor is effective in individuals' financial decisions.

1.2.1.2.Financial Decision Maker's Age

The age factor in the financial decision-making process can also be said to have an influence on investors' financial decisions. In a study conducted by Jagannathan and Kocherlakota (1996), it was found that investment decisions differ depending on whether the investors are young or old and older investors tend to focus on lower risk investments in the short term, with a small portion of their existing assets, and while younger investors tend to focus on higher-risk investments in the long term, with a larger portion of their existing assets. Armağan (2007: 45) explains that in financial decisions, investors think that they have time to compensate for possible losses that may occur because they are young, while the elderly do not have much time and have less tolerance for taking risks, leading to differences in financial decisions between the young and the old. Büker (1976) states that in financial investment decisions, available cash varies according to individuals' age categories. Young individuals tend to invest instead of holding cash, while older individuals prefer to hold cash. When considering the risk factor, individuals are known to exhibit different financial decision-making approaches in various periods of their lives, such as the accumulation period by making investments, securing existing financial resources, spending their financial resources, and rewarding themselves (Karan, 2001: 694). The differentiation of individual investors'

financial decisions by age groups leads to the acknowledgment of age as one of the fundamental factors influencing individuals' financial decisions.

1.2.1.3.Financial Decision Maker's Education and Knowledge Level

Individual investors exhibit different approaches in their financial decisions based on their levels of knowledge and experience. Anber and Eker (2009: 150) mention that individuals' knowledge and experience play a significant role in financial investment decisions based on herd psychology in the financial decision-making process and that individuals with high knowledge and experience are less affected by herd psychology and make financial decisions with less influence from others. Usul et al. (2002: 136) argue that when investors have low knowledge and experience in making financial decisions, they tend to choose investment channels that do not require knowledge and experience, while they tend to stay away from investment channels that require knowledge and experience. Grable and Lytton (1998: 65) have determined that individuals act based on their knowledge and experience when evaluating the risk factor in their financial decisions and that individuals with higher knowledge and experience are more successful in assessing risk in their investment decisions. When looking at the assets and financial assets owned as a result of financial decisions, it is known that individuals with high assets have college-level education, while those with low assets are high school grraduates (Hallahan et al., 2004). It has been found that the level of risk tolerance, the most important factor in the financial decision-making process, also differs based on individuals' education levels and individuals with a higher level of education have higher risk tolerance levels in their risk tolerance ranges (Grable, 2000; Grable and Joe, 2004; Hawley and Fujii, 1993; Brown and Taylor, 2007). When these studies are analysed, it is evident that investors' financial decision-making processes differ based on their education levels, and it is considered accurate to classify this factor among personality factors.

1.2.1.4.Financial Decision Maker's Occupation and Income Level

The income levels and occupations of individual investors play a significant role in their financial decision-making processes. It is clear that individuals with insufficient income levels to invest tend to avoid financial investments, while individuals with higher income levels tend to opt for riskier investments due to their higher risk tolerance (Aşıkoğlu, 1983: 24). Venter (2006: 19) states that individuals with higher income levels can afford more losses than those with lower income levels, and they may take risks in their financial decisions and this difference in risk tolerance can lead to different financial decisions based on income levels. It is also observed in the literature that there is a positive relationship between

individuals' income and assets and their risk-taking behavior in financial decisions (Finke and Huston, 2003; Grable and Joe, 2004; Grable et al., 2006). Considering that income and assets increase the capacity for risk-taking and consequently affect financial decisions, it is accurate to classify this factor among personality factors

1.2.1.5.Financial Decision Maker's Risk Preferences and Expectations

In financial decisions, the most important expectation for individual investors is that the relationship between risk and investment expectations is meaningful. Financial investors make their decisions based on general expectations regarding the investment instruments. Investors typically look at the historical investment return rates of these investment instruments to determine these expectations. Based on these investment return rates, they tend to focus on investment options in the high return and low-risk category (Ritter, 1994: 4). In addition to the investment return rates offered by investment instruments, the risk levels also matter to investors. Therefore, Anber and Eker (2009: 150) have categorized investors based on risk groups. These risk groups include risk-loving and risk-oriented investors,investors indifferent to risk, and investors avoiding risky situations.

Individual investors not only differ in terms of risk categories but also in terms of investment returns. Theere also differences between personality traits of investors who decide on investment instruments with high returns and high-risk levels and investors who have high risk levels and low return levels (Patterson, 1994). Ultimately, the level of return directly influences investors' willingness to accept risk (Usul et al., 2002). Consequently, it becomes necessary to consider individuals' expectations and risk attitudes as personality factors in the financial decision-making process.

1.2.2.Environmental Factors

In addition to personality factors, there are environmental factors that directly influence the financial decision-making processes of individuals. These environmental factors have been dealt with from various perspectives in different studies. According to Böyükaslan (2012), environmental factors include an individual's family, social and cultural environment, and other influence groups affecting the individual. Güleç (2019) classifies environmental factors as the investor's family, the investor's social and cultural environment, and the reference groups accepted by the investor. According to Altaş (2019), environmental factors include the individual investor's immediate surroundings and family, the individual investor's social and cultural environment, and other influence groups affecting individual investors.

Considering the classifications of environmental factors in various studies, it can be concluded that the environmental factors influencing individual financial decisions include *the financial decision maker's family and immediate surroundings, the financial decision maker's social and cultural environment*, and *other reference groups influencing the financial decision maker*. These factors are briefly explained below.

1.2.2.2. Financial Decision Maker's Family and Immediate Surroundings

The fundamental element affected by the decisions made by individuals is their families. It is observed that the family has an impact on the financial decisions made by the individual, and that family recommendations affect the financial decisions of the individual (Böyükaslan, 2012: 76). In a study by Özaltın et al. (2015: 404), among the environmental factors affecting individual investors, the influence of family and immediate surroundings on financial decisions is attributed to the fact that the family is affected by the decisions taken and they live together with the individual. The shared use of financial resources among family members and the effect of these resources on the family's future also support the inclusion of the family among environmental factors.

1.2.3. Financial Decision Maker's Social and Cultural Environment

Decision-making involves the choices individuals make among alternatives when faced with problems. These choices arise as a natural consequence of an individual's cultural environment and social surroundings, in addition to being individual decisions. When making financial decisions, individuals are influenced by their social environment and the cultural context of the society they belong to.

Özaltın et al. (2015: 404) explain that individuals make financial decisions based on the cultural context inherited from previous generations, as cultural structures of societies are handed down through generations.

İnan (2010) suggests that individual investors may make investment and financial decisions influenced by their social environment and can make a financial decision that is not in their mind based on interpretations made by their social environment regarding the success of that investment decision.

In addition to an individual's education level, which is considered among personality factors, the education level of an individual's social environment also influences financial decisions. A high level of education in an individual's social environment encourages the individual to analyze investment instruments before making investment decisions, whereas a lower education level in an individual's social environment may lead the individual to approach financial decisions intuitively (Usul et al., 2002: 139).

1.2.3.1.Other Reference Goups Influencing Financial Decision-Making

Individuals tend to emulate and accept the decisions made by other individuals they consider as role models within their society when making financial decisions. When making financial decisions, individuals often regard individuals in their circle who have made successful financial investments as a source of absolute truth and make decisions accordingly. Barak (2008: 23) argues that the economic and political structure within the country to which an individual belongs will influence the decisions made by the individual and they may consider the overall economic situation of the country as a reference point and develop their financial decisions accordingly. Taner and Akkaya (2005: 54) state that individuals tend to act collectively with other individuals when making their investments. This implies that individuals can make investment decisions influenced by the common attitudes of other individuals, even if those individuals are not in immediate surroundings. Ultimately, it is accepted that individuals can be influenced by other individuals' financial decision-making behavior, even if they are not part of their immediate surroundings.

1.2.4.Financial and Economic Factors

In the process of making financial decisions, individuals are influenced not only by personality and environmental factors but also by the existing financial and economic factors. Given that the primary determinants of financial and economic factors are the macroeconomic environment, these factors affect individual investors at a macro analysis level. Although financial and economic factors are classified differently in various studies based on different perspectives, Böyükaslan (2012) primarily categorizes them as the individual's intention to preserve their capital, the individual's demand for economic value increase, and the individual's intention to ensure the continuity of their current income.

The financial and economic factors presented above are detailed below, assuming that they directly impact an individual's financial decisions

1.2.4.1.Financial Decision-Maker's Intention to Protect Current Capital

The impact of macroeconomic indicators on current financial investment decisions directly affects individual investors' decisions. Economic indicators of the countries play and active role in the financial decisions of the investors; therefore, interest rates, inflation indicators, import-export balances of the countries, and the sectoral values earned by businesses operating within the country are factors that individual investors should consider due to their active role in influencing financial decisions.

Individual investors have to act according to these economic indicators to protect and increase their existing capital (Böyükaslan, 2012). Within this context, the desire of individual investors to protect their capital and make decisions based on these economic indicators plays an active role in the financial decision-making process.

1.2.4.2.Financial Decision Maker's Demand for Economic Value Increase

Individual investors expect an increase in their current economic values as a result of their investments. When they believe that investment instruments will not yield economic value increase, they tend to distance themselves from those instruments and turn to investment instruments with the expectation of economic value increase. A key determinant of the expectation of economic value increase is the time constraint. The expectation, whether it is short-term or long-term, influences individuals' financial decisions, leading them to make decisions accordingly. Apart from the time constraint, a significant limitation is the risk constraint. Individual investors focus on the relationship between the expected economic value increase and the risk involved in achieving that increase in value. There should be a meaningful relationship between increase in economic value and the risk taken, and financial decisions should be based on this relationship. Therefore, economic value increase is considered among the economic and financial factors that influence individuals' decisions in their financial choices.

1.2.4.3.Financial Decision Maker's Demand for Continuity of Economic Curent Income

The continuity of income in investment decisions encourages individual investors to lean toward investment types that offer a continuous income. Providing continuous income ranks high among the financial investment objectives, helping individuals manage their expectations. High income fluctuations related to investments, however, influence individuals to turn to investment instruments with lower income fluctuations, affecting their decision-making processes. Therefore, when considering the impact of economic income indicators related to investment instruments on individual investor decisions, this factor supports its position among the economic and financial factors influencing financial decisions.

2.METHOD

2.1.Objective, Scope and Limitations of the Study

The purpose of this study is to examine the financial behaviors of investors based on their demographic characteristics. The scope of this research includes individuals with a monthly income of 4,500 TL or more

who save and invest their savings. The survey questions were directed to individuals aged 18 and above who meet these criteria, and their responses were collected. A fundamental assumption accepted in the study is that the individuals participating in the survey answered the questions sincerely and truthfully. Additionally, it is assumed that the selected sample represents the main population. The population of the study consists of Turkish citizens aged 18 and above, with a monthly income of at least 4,500 TL or more, and potential for investment. According to data from the Turkish Statistical Institute (TurkStat), the estimated number of individuals living in Turkey and falling within the scope of this research is approximately 60 million people as of the year 2020.

According to the Address-Based Population Registration System (ADNKS) results, in 2020, the female population was 41,698,377, and the male population was 41,915,985. In other words, women make up 49.9% of the total population, while men make up 50.1%. Using a purposive sampling method, the data for the study were collected from individuals intentionally selected from this main population, who are aged 18 and above and have a monthly income of 4,500 TL or more.

The number of participants who responded to the statements in the research survey was 1,950. During the implementation of the survey, the poverty line (7,532 TL) and the starvation line (2,178 TL) declared by the Turkish Confederation of Trade Unions (TURK-IS) for the year 2020 were taken into account and the responses of individuals with an income twice the minimum wage were evaluated, and the study continued accordingly. Therefore, the surveys obtained from participants with a monthly income of 4,500 TL or more were considered valid. The number of surveys considered valid was determined to be 401. In the social sciences, a general opinion is that a 5% margin of error is acceptable. According to Sekeran (1992), a sample size of at least 384 is required to represent a population of more than 10 million with a 5% margin of error. Thus, the valid sample size of 401 individuals is considered sufficient for this study.

2.2.Data Collection Tools for the Research

In this research, a questionnaire consisting of 19 statements was used to determine participants' demographic characteristics and their investment preferences. To measure the financial behaviors of individuals, a scale consisting of 11 statements, prepared by Dew and Xiao (2011), was employed. Additionally, a question from Renneboog and Spaenjers (2012) regarding individuals' financial decisions, specifically, "Have you saved money as a family in the last 12 months?" was included in the survey. Therefore, the questionnaire contains a total of 43 questions and statements, including demographic questions.

2.3.Hypotheses of the Research

The hypotheses tested in the study are as follows:

H1: The financial behaviors of individual investors differ based on their demographic characteristics.

H1a: The financial behaviors of individual investors differ based on their gender.

H1b: The financial behaviors of individual investors differ based on their marital status.

H1c: The financial behaviors of individual investors differ based on their age.

H1d: The financial behaviors of individual investors differ based on their educational level. H1e: The financial behaviors of individual investors differ based on their monthly income.

H2: The financial behaviors of individual investors differ based on their saving status in the last 12 months.

H3: The financial behaviors of individual investors differ based on whether they own their houses.

H4: The financial behaviors of individual investors differ based on whether they have investment accounts.

H5: The financial behaviors of individual investors differ based on whether they own their own cars.

H6: The financial behaviors of individual investors differ based on whether their religious beliefs influence their investment decisions.

3.FINDINGS

In this section, the findings obtained from the analysis of the research data are presented

3.1.Demographic Findings

58.4% of the participants are male and 41.6% are female. 74.8% of the participants are married and 25.2% are single. 11% of the participants are between the ages of 18-25, 32.4% between the ages of 26-33, and 26.9% between the ages of 34-41. 17% of the participants are between the ages of 42-49, 8.5% between the ages of 50-57, 4% between the ages of 58-63, and 0.2% between the ages of 67-71. 3.5% of the participants have completed primary education, 24.2% have completed secondary education, 55.4% have university degrees, and 17% have postgraduate education.

When the distribution of the participants according to their income

status is analyzed, 38.9% of the participants have a monthly income between 4501-5250 TL, 21.9% of the participants have an income between 5251-6000 TL, 11.5% of the participants have an income between 6001-6750 TL, 8% of the participants have an income between 6751-7500 TL, 4, 7% of the participants have an income is between 7501-8250 TL, 3.5% have 8251-9000 TL, 1.7% have an income between 9001-9750 TL, 4.5% have an income between 9751-10500 TL, 1.5% have and income between 10501-11250 TL, 3.7% have an income between 11251 TL and above.

When the distribution of the participants according to the number of members in their families is analyzed, 11.2% live alone, 76.8% live with 2-4 family members, 11% with 5-7 family members, 0.7% with 8-10 family members, and 0.2% with 11 or more family members.

When the distribution of the participants according to the number of members in their households is analyzed, 11.2% live alone, 76.8% live with 2-4 family members, 11% with 5-7 family members, 0.7% with 8-10 family members, and 0.2% with 11 or more family members.

The distribution of the participants according to their investment status is given below. Among the participants, 61.8% have their own house, 66.3% have their own automobile, 63.3% have investment accounts, and 21.4% invest in stocks.

3.2. Investigating the Conformity of Data to Normal Distribution

Table 1: *Descriptive Statistics and Normality Test for the Financial Behaviour Scale*

Dimensions	n	Mean	ss	Skewness	Kurtosis
General Financial Behaviour	401	3,90	0,669	-0,440	-0,686
Cash Management (CM)	401	4,08	0,765	-0,667	-0,194
Credit Management (CrM)	401	4,16	0,879	-0,794	-0,377
Savings and Investment (S&I)	401	3,39	1,135	-0,409	-0,735

As seen in Table 1, both the general version of the Financial Behavior scale and its three sub-dimensions have met the conditions for a normal distribution. Therefore, parametric tests can be employed for the analysis.

3.3. Reliability Analysis

Table 2: *Reliability Coefficients for the Financial Behaviour and Psychological Factors Scales*

Dimensions	Number of Items	Cronbach's Alpha
General Financial Behaviour	10	0,770
Cash Management (CM)	3	0,539
Credit Management (CrM)	3	0,585
Savings and Investment (S&I)	4	0,807

As seen in Table 2, the overall reliability coefficient of the Financial Behavior Scale is 0.770. Accordingly, the scale is considered "quite reliable". While the reliability of the Cash Management and Credit Management sub-dimensions is slightly lower (CM: 0.539 and CrM: 0.585), the Savings and Investment dimension is "highly reliable" (S&I: 0.807). Taking all these values into account, it can be said that the scale used in the study has appropriate reliability levels, and thus, the results of the analyses can be relied on.

3.4. Validity Analysis

Factor Analysis was used to determine the construct validity of the scales used in the study, that is, whether these scales measure the desired feature to be measured.

Table 3: *KMO and Bartlett Test Results of the Financial Behavior Scale*

KMO		0,793
Bartlett Test	$?^2$	1046,968
	sd	45
	P	0,000

In the factor analysis conducted for the Financial Behavior Scale, the KMO value was calculated as 0.793. Accordingly, the sample size is suitable for factor analysis (KMO>0.60). Within the scope of Bartlett's test, 2 value was found to be 1046.968 and statistically significant (P=0.000<0.05). In other words, it was determined that the correlation between the statements used in the scale was suitable for factor analysis. Thus, according to the results of KMO and Bartlett test, it was concluded that factor analysis could be performed with the data in question.

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3.5 Hypothesis Testing

In this section, the results of the independent samples t-test and One-Way ANOVA test, which were conducted to examine whether there are differences in scale scores based on socio-demographic variables, are presented. The results of the independent samples t-test for examining Financial Behavior by gender are presented in Table 4 below.

Table 4: *Analysis of Financial Behaviour by Gender*

Gender		**n**	$\bar{X}$	**ss**	**sd**	**t**	**P**
Financial Behaviour	Male	234	3,86	0,69	399	-1,174	0,241
	Female	167	3,94	0,63			

According to the results of the t-test conducted to determine whether there is a difference in Financial Behavior between genders, it was observed that there was no statistically significant difference in Financial Behavior between males and females (t(399) = -1.174; P = 0.241 > 0.05). Thus, the hypothesis "H1a: The financial behaviors of individual investors differ based on their gender" is not accepted.

The results of the independent samples t-test for examining Financial Behavior by marital status are presented in Table 5 below.

Table 5: *Analysis of Financial Behaviour by Marital Status*

Marital Status		**n**	$\bar{X}$	**ss**	**sd**	**t**	**P**
Financial Behaviour	Married	300	3,90	0,69	399	0,158	0,874
	Single	101	3,89	0,62			

According to the results of the t-test conducted to determine whether there is a difference in Financial Behavior in terms of marital status, no statistically significant difference was found between the groups with different marital status in terms of Financial Behavior (t(399) =0.158; P=0.874>0.05). Accordingly, "H1b: Financial Behavior of individual investors differs according to their marital status" hypothesis is not accepted.

The results of the ANOVA test conducted to examine financial behavior in terms of age are given in Table 6 below.

Table 6: *Analysis of Financial Behaviour by Age*

	Age	**n**	**X̄**	**ss**	**F**	**P**
Financial Behaviour	18-25	44	4,00	0,53	1,290	0,267
	26-33	130	3,88	0,66		
	34-41	108	3,93	0,70		
	42-49	68	3,89	0,66		
	50-57	34	3,89	0,73		
	58-63	17	3,35	0,80		

To determine whether there is a difference in Financial Behavior based on age, the results of the ANOVA test show that there was no statistically significant difference in Financial Behavior among groups with different ages ($F(5,395) = 1.290$; $P = 0.267 > 0.05$). Thus, the hypothesis "H1c: The financial behaviors of individual investors differ based on their age" is not accepted.

The results of the ANOVA test for analysing Behavior by education level are presented in Table 7 below.

Tablo 7: *Analysis of Financial Behaviour by Education Level*

	Eğitim Durumu	**n**	**X̄**	**ss**	**F**	**P**
Financial Behaviour	Elementary	14	3,59	0,70	2,556	0,055
	Secondary	97	3,79	0,66		
	University	222	3,93	0,67		
	Postgraduate	68	3,99	0,64		

According to the results of the ANOVA test conducted to determine whether there is a difference in Financial Behavior based on education, it was observed that there was no statistically significant difference in Financial Behavior among groups with different education levels ($F(3,397) = 2.556$; $P = 0.055 > 0.05$). Thus, the hypothesis "H1d: The financial behaviors of individual investors differ based on their education level" is not accepted.

The results of the ANOVA test for analysing Financial Behavior by income level are presented in Table 8.

Table 8: *Analysis of Financial Behaviour by Income Level*

	Income Level	**n**	**X̄**	**ss**	**F**	**P**
Financial Behaviour	4500-5250 TL	156	3,76	0,69	2,164	0,046
	5251-6000 TL	88	3,91	0,69		
	6001-6750 TL	46	4,04	0,57		
	6751-7500 TL	32	3,98	0,63		
	7501-8250 TL	19	4,01	0,40		
	8251-9000 TL	14	3,99	0,80		
	9000 TL üstü	46	4,06	0,67		
Levene statistics: 1,802; P=0,097						
Post-hoc test (LSD test results)			**Mean Difference**			**P**
4500-5250 TL	6001-6750 TL		-0,27741			0,013
	9000 TL üstü		-0,30113			0,007

According to the results of the ANOVA test conducted to determine whether there is a difference in Financial Behavior based on income, there was a statistically significant difference in Financial Behavior among groups with different income levels ($F(6,394) = 2.164$; $P = 0.046 < 0.05$). According to the Post hoc (LSD) test conducted to determine between which groups the difference lies, it was found that there is a significant difference between those with income between 4500-5250 TL and those with income between 6001-6750 TL and those with income above 9000 TL. The Financial Behavior score of individuals with an income level between 4500-5250 TL is 0.27741 points lower than those with incomes between 6001-6750 TL and 0.30113 points lower than those with incomes above 9000 TL. Therefore, the hypothesis "H1e: The financial behaviors of individual investors differ based on their monthly incomes" is accepted.

Based on the results of all these tests, the hypothesis "H1: The financial behaviors of individual investors differ based on their demographic characteristics" is partially accepted.

The results of the independent samples t-test for examining Financial Behavior based on whether individual investors saved money in the last 12 months are presented in Table 9 below.

Table 9: *Analysis of Financial Behavior based on whether individual investors saved money in the last 12 months*

Savings in the last 12 months		**n**	**X̄**	**ss**	**sd**	**t**	**P**
Financial Behaviour	Yes	330	4,03	0,60	399	9,321	0,000
	No	71	3,29	0,64			

The results of the t-test conducted to determine whether there is a difference in Financial Behavior of individual investors based on their savings in the last 12 months show that there is a statistically significant difference in the Financial Behavior of individual investors based on their savings in the last 12 months ($t(399) = 9.321$; $P = 0.000 < 0.05$). The average Financial Behavior score of those who saved money in the last 12 months was 4.03, while the average score of those who did not save money in the last 12 months was 3.29. In other words, the average Financial Behavior score of those who saved money in the last 12 months is significantly higher. Therefore, the hypothesis "H2: The financial behaviors of individual investors differ based on their savings in the last 12 months" is accepted.

The results of the independent samples t-test for examining the Financial Behavior of individual investors based on whether they own their homes are presented in Table 10 below

Table 10: *Analysis of Financial Behavior of individual investors based on whether they own a house*

Owning a house		**n**	**X̄**	**ss**	**sd**	**t**	**P**
Financial Behaviour	Yes	248	3,96	0,65	399	2,659	0,008
	No	153	3,78	0,69			

The results of the t-test conducted to determine whether there is a difference in Financial Behavior of individual investors based on whether they own their homes show that there is a statistically significant difference in the Financial Behavior of individual investors based on whether they own a house ($t(399) = 2.659$; $P = 0.008 < 0.05$). The average Financial Behavior score of those who own a house is 3.96, while the average score of those who do not own a house is 3.78. In other words, the average Financial Behavior score of those who own a house is significantly higher. Therefore, the hypothesis "H3: The financial behaviors of individual investors differ based on whether they own their houses" is accepted.

The results of the independent samples t-test for examining the Financial Behavior of individual investors based on whether they have investment accounts are presented in Table 11 below.

Table 11: *Analysis of Financial Behavior of individual investors based on whether they have investment accounts*

Having an Investment Account		**n**	**X̄**	**ss**	**sd**	**t**	**P**
Financial Behaviour	Yes	254	4,05	0,61	277,094	6,292	0,000
	No	147	3,62	0,68			

The results of the t-test conducted to determine whether Financial Behavior of individual investors differ based on whether they have investment accounts indicate that there is a statistically significant difference in the Financial Behavior of individual investors based on whether they have investment accounts (t(277.094) = 6.292; P = 0.000 < 0.05). The average Financial Behavior score of those with investment accounts is 4.05, while the average score of those without investment accounts is 3.62. In other words, the average Financial Behavior score of those with investment accounts is significantly higher. Therefore, the hypothesis "H4: The financial behaviors of individual investors differ based on whether they have investment accounts" is accepted.

The results of the independent samples t-test for examining the Financial Behavior of individual investors based on whether they own their cars are presented in Table 12 below.

Table 12: *Analysis of Financial Behavior of individual investors based on whether they own their cars*

Owning a car		**n**	**X̄**	**ss**	**sd**	**t**	**P**
Financial Behaviour	Yes	266	3,93	0,65	399	1,507	0,133
	No	135	3,82	0,71			

According to the results of the t-test conducted to examine whether there is a difference in Financial Behavior in terms of whether individual investors have their own automobiles or not, there is no statistically significant difference according to whether individual investors have their own automobiles or not (t(399) =1.507; P=0.133>0.05). In other words, the Financial Behavior averages of those who have their own automobiles and those who do not have their own automobiles are close to each other. Accordingly, the hypothesis "H5: Financial Behavior of individual investors differs according to whether they own a car or not" is not accepted.

The results of the independent samples t-test conducted to examine Financial Behavior in terms of the effect of individual investors' religious beliefs on their investment decisions are given in Table 13 below.

The results of the t-test conducted to determine whether there is a difference in Financial Behavior of individual investors based on whether they own cars indicate that there is no statistically significant difference in the Financial Behavior of individual investors based on whether they own a car ($t(399) = 1.507$; $P = 0.133 > 0.05$). In other words, the average Financial Behavior score of those who own their cars is similar to the average score of those who do not. Therefore, the hypothesis "H5: The financial behaviors of individual investors differ based on whether they own their cars" is not accepted.

The results of the independent samples t-test for examining the impact of the religious beliefs of individual investors on their investment decisions are presented in Table 13 below.

Table 13: *Analysis of the Financial Behaviour based whether religious beliefs of individual investors have an impact on their investment decisions*

Impact of religious beliefs on investment decisions		**n**	**$\bar{X}$**	**ss**	**sd**	**t**	**P**
Financial Behaviour	Yes	195	3,89	0,68	399	-0,032	0,974
	No	206	3,90	0,66			

The results of the t-test conducted to determine whether individual investors' religious beliefs have an impact on their investment decisions in terms of Financial Behavior show that there is no statistically significant difference in Financial Behavior based on whether religious beliefs affect investment decisions ($t(399) = -0.032$; $P = 0.974 > 0.05$). In other words, the average Financial Behavior score is similar for those who believe that religious beliefs influence investment decisions and those who do not. Therefore, the hypothesis "H6: The financial behaviors of individual investors differ based on whether their religious beliefs influence investment decisions" is not accepted.

DISCUSSION AND CONCLUSION

The financial behaviors of individual investors are influenced by various factors. Some investors prefer commodity assets such as gold, often seen as a "safe haven", while others choose to invest in real estate. However, investment preferences that may be riskier, such as stocks, can vary depending on the psychological factors of the investor. In this regard, it can be said that individual investors' financial investment decisions in a country are related to both individuals' psychology and the country's economic situation. Except for professional financial analysts and economists, most individual investors do not use technical tools or methods. This makes it challenging but significant for the markets to predict how these investors

make decisions (Simon et al., 1987: 26). On the other hand, professional investors mostly base their investment decisions on fundamental analysis, technical analysis, and trading analysis. In fundamental analysis, the credit risk premium or credit default swap (CDS) of the country where the investment will be made is taken into consideration. In other words, CDS represents the premium demanded by an insurance company to insure the country.

Analyzing the participants' ownership of car or home insurance policies, it was found that the percentage of participants having car or house insurance policies is around 69%, while the rate of having health and life insurance policies is approximately 30%. It is evident that the participants attach more importance to car or home insurance while they do not prioritize health and life insurance significantly.

When looking at whether the participants saved money as a family in the past 12 months, it was observed that the rate of savings was about 82%. This indicates that participants tend to protect themselves against potential risks with the motivation to minimize losses in the future. When evaluating how participants invested their savings in gold and real estate, it was found that gold investments were evenly distributed in percentage. Possible reasons for individual investors to behave this way include gold being considered a safe haven during crisis periods and an important part of risk diversification in creating portfolios, particularly during high inflation periods. The fact that gold retains its real physical value, is used as a medium of exchange in some transactions, is convertible, and perhaps derives from the tradition of storing gold under the mattress in Turkish customs and traditions could also be significant factors in gold investment in Turkey.

When analyzing how participants invest their savings in real estate, it was observed that only around 46% of individual investors were involved in real estate investments. Several reasons could explain this situation such as high real estate prices, insufficient cash flow from monthly rent income, high interest rates on housing loans, and the need for a certain level of down payment to purchase a house. Additionally, some individual investors may prefer to allocate their resources to different financial instruments.

Regarding the responses of the participants about financial behavior, the statement "I pay all my bills on time" was the most agreed upon. This could be considered an indication of participants' responsibility in managing their debts. On the other hand, the least agreed-upon statement was "I spend more than the credit limits on one or more credit cards". This may suggest that participants are maintaining a balance between income and expenses.

In this study, the financial behaviors of individual investors were examined concerning demographic characteristics. There are many other studies that have explored similar relationships (Bajtelsmit & Bernasek, 1996; Wang & Hanna, 1997; Larkin et al., 2013; Lan et al., 2018). The results of the hypotheses tested in this context are explained below.

The analysis revealed that financial behaviors did not differ based on gender. This result is consistent with studies conducted by Clarke et al. (2003) and Jorgensen et al. (2010). However, there are studies in the literature that suggest otherwise. For instance, according to Hollowell (2017), men may have more freedom in making independent financial investment decisions compared to women. Additionally, Hollowell suggests that communication based on family financial investments has a significant and vital impact on financial behavior.

The findings indicate that the financial behaviors of individual investors do not differ based on marital status. A similar result was obtained by Raley et al. (2006), who argued that this might vary according to the family's income or the duration of the marriage. Gudmunson and Danes (2011) also argue that rather than directly focusing on demographic characteristics, it might be more appropriate to investigate the socio-economic and educational status of the family, and this supports the results of this study.

In this study, the analysis found that investors' age did not lead to differences in their financial behaviors. In other words, the age of individual investors was not a distinctive factor influencing their financial behaviors. A similar result was obtained by Obamuyi (2013). In his study, Obamuyi suggested that investors in the middle and upper age groups tend to adopt a more conservative investment policy, while younger investors tend to make investment preferences driven by the desire for quick wealth. However, he also stated that this distinction is not a significant determining factor. Similarly, this result aligns with findings from different countries such as Nigeria (Obamuvi, 2013), Pakistan (Kaleem et al., 2009), and India (Geetha & Ramesh, 2012).

As a result of the analyses, it was found that the educational background of individual investors did not significantly affect their financial behaviors. Similarly, a study conducted in Nigeria by Obamuvi (2013) found that only investors with master's and doctoral degrees exhibited different behaviors compared to others, which aligns with the findings for other educational groups in this study.

The analysis revealed that individual investors' financial behaviors differed based on their monthly income. Specifically, those with incomes between 4500-5250 had an average Financial Behavior score 0.33 points lower than those with incomes between 6001-6750, and 0.34 points lower

than those with incomes above 9000. This finding is consistent with the results obtained in the study conducted by Alquraan et al. (2016), where the author concluded that the amount of monthly income, whether high or low, had a significant impact on investor behaviors.

According to the analysis results, the financial behaviors of individual investors differed based on their savings in the last 12 months. Therefore, investors who saved money in the last 12 months had a significantly higher average Financial Behavior score compared to those who did not save. The analysis also showed that the financial behavior of individual investors varied based on whether they owned their houses. Those who owned their houses had a significantly higher average Financial Behavior score. It is understood that Financial Behavior differs according to whether individual investors have investment accounts. In short, the average Financial Behavior of those with investment accounts is significantly higher. Additionally, the presence of investment accounts also influenced financial behaviors, with those having investment accounts having a significantly higher average Financial Behavior score. Furthermore, the analysis results indicated that the ownership of an automobile did not lead to significant differences in financial behaviors. In other words, individuals who owned an automobile showed similar financial behaviors to those who did not own one. Lastly, the study found that financial behaviors were not significantly different based on individual investors' religious beliefs. In summary, the average financial behavior scores were similar for those who believed that religious beliefs influenced their investment decisions and those who did not believe in such an influence.

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Chapter 8

THE IMPACT OF NEW GENERATION FINANCIAL INSTRUMENTS: FROM CRYPTOCURRENCIES TO THE STOCK EXCHANGES OF JAPAN, CANADA, AND SOUTH KOREA

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1. INTRODUCTION

As a result of the developments and changes in technologies, financial markets have also undergone a significant transformation in recent years, taking their share from this change. Especially the innovative and applicable solutions offered by blockchain technology have paved the way for the transformation of traditional financial instruments and the emergence of new generation financial products. In this context, cryptocurrencies have taken on an important role in the financial system due to their decentralized structures and rapid growth. The cryptocurrency process, which began with the launch of Bitcoin in 2009, quickly reached a global scale and became a phenomenon. Today, leading cryptocurrencies in the market such as Bitcoin, Ethereum, Tether, Ripple, and Binecoin are considered not only as investment tools but also as significant determinants of market volatility.

The price volatility and speculative nature of cryptocurrencies have made it necessary to examine their relationship with traditional financial markets. Therefore, it is important to reveal the impact of the cryptocurrency market on traditional financial markets. Due to this importance, this study has been conducted. The study seeks to answer the question of how the volatility in cryptocurrency markets affects traditional financial markets. In this context, the aim of the study is to analyze the impact of cryptocurrency markets, particularly major cryptocurrencies such as Bitcoin, Ethereum, Tether, Ripple, and Binance Coin, on the stock market performances of leading countries like Japan, Canada, and South Korea. For this purpose, monthly data from April 2016 to June 2024 has been used for the economies of Japan, South Korea, and Canada. In the analysis of the data, the VAR model was used to identify short-term effects, while the VECM model was employed to identify long-term effects. The main motivation of the research is to understand how developments in the cryptocurrency markets impact traditional stock markets. Cryptocurrencies are in the spotlight not only for their high returns but also for their extreme volatility and regulatory uncertainties. Therefore, it has been deemed necessary to conduct this study, as evaluating the relationship between cryptocurrency markets and stock exchanges is considered vital for investors, regulators, and policymakers. The study is expected to contribute new and up-to-date data to the literature on the impact of cryptocurrencies on financial markets.

The study consists of five sections in line with its purpose, with the introduction explained in the first section and the current studies in the literature presented in a summary table in the second section. In the third section of the study, the methodology of the research is explained. In the fourth chapter, the findings of the research and interpretations of the

findings are explained. In the fifth and final chapter, the conclusion of the study is presented, completing the research.

2. LITERATURE

Table 1: Literature Review

Writers	Dataset	Methodology	Findings
Pala (2024)	Germany, the USA, and the UK (April 2016-June 2024)	ARDL Test	For the financial markets of England, it has been determined that there is no significant relationship between the cryptocurrency markets and stock market returns in both the long and short term. For the German financial markets, a significant and positive long-term relationship has been identified between the cryptocurrency market assets Bitcoin and Tether and stock market returns. In the short term, no significant relationship has been identified. For the long term in the US financial markets, it has been determined that there is a significant and positive relationship between Bitcoin, a cryptocurrency market asset, and stock market returns, while there is no significant relationship between Ethereum and Tether and stock market returns. In the short term, no significant relationship has been identified.
Toudas et al. (2024)	USA (October 2014-December 2023)	ARIMA Model	As a result of the study, they concluded that there is a statistically significant and positive relationship between the Dow Jones stock index and Bitcoin.
Akkaya and Küçükpınar (2023)	United States of America, Japan, Germany, Turkey, India, and the People's Republic of China (January 12, 2018 - December 31, 2022)	GARCH and EGARCH Model	As a result of this study, which aimed to determine the volatility and the spread of volatility for the mentioned countries, it was concluded that the BIST Istanbul 100 index and the DAX index were statistically significant, and that the asymmetric effect of the volatility spread was negative and noteworthy. Additionally, they have also stated that there is a volatility spillover from the DAX and NIFTY indices to the Borsa Istanbul 100 index.
Mgadmi et al. (2023)	USA, Canadian, French, and Ukrainian (February 24, 2022 - April 12, 2023)	ARIMA Model and Granger Causality Test	As a result of the study, it has been concluded that in the long term, American, Canadian, French, and Ukrainian stock indices have a positive and significant impact on Bitcoin.
Demir (2022)	Borsa İstanbul (BIST) Turkiye	Bayer-Hanck Cointegration Test	As a result of the study, it was determined that there is a positive relationship between Bitcoin and the BIST index both in the short term and in the long term.

Korkmazgöz et al. (2022)	Borsa İstanbul (BIST) Turkiye	ARDL Bounds Test	As a result of the study, they concluded that there is a long-term relationship between the Bitcoin price and the Borsa Istanbul Financial Index, but there is no long-term relationship between the Bitcoin price and other index prices. Additionally, the short-term findings indicated that there is no significant relationship between the Bitcoin price and the Borsa Istanbul Financial Price Index.
Thaker and Mand (2021)	Japan, Korea, Singapore, the Philippines, and Hong Kong (July 20, 2010 - April 26, 2019)	VECM and Granger Causality Test	As a result of the study, it was concluded that there is a negative relationship between Bitcoin and the stock exchanges of Japan, Korea, and Hong Kong.
Soyaslan (2020)	Borsa İstanbul (BIST) Turkiye (April 21, 2011 - February 11, 2020)	Johansen Cointegration and Granger Causality Test	As a result of the study, a relationship was identified between Bitcoin and BIST 100 in the long term, while no significant relationship was found between Bitcoin and other indices.
Çıkrıkçı and Özyeşil (2019)	Turkiye and nine different Southeast Asian countries (February 22, 2012 to August 15, 2018)	Panel Data Analysis	As a result of the study, a negative relationship was found between the stock market returns of the examined countries and the Bitcoin return rates.
Tiwari et al. (2019)	USA - S&P 500 9 (September 2011 - February 24, 2018)	GARCH Model	As a result of the study, it was determined that volatility in both markets reacted more strongly to negative shocks compared to positive shocks.
Baek and Elbeck (2015)	USA, S&P 500 (July 2010 to February 2014)	Regression Analysis	As a result of the study, it was concluded that changes in Bitcoin prices have no effect on the S&P 500 index.

3. METHODOLOGY

3.1. The Study's Dataset

The aim of the study is to analyze the effects of cryptocurrency markets, particularly major cryptocurrencies such as Bitcoin, Ethereum, Tether, Ripple, and Binance Coin, on the stock market performances of leading countries like Japan, Canada, and South Korea. For this purpose, monthly data from April 2016 to June 2024 has been used for the economies of Japan, South Korea, and Canada. As the dependent variable, the natural logarithm of the Nikkei 225 (N225) index for the Japanese economy, the KORE KOSPI (KOSPI) index for the South Korean economy, and the S&P/TSX (GSPTSE) index for the Canadian economy were used. As independent variables, Bitcoin, Ethereum, Tether USDt, BNB, and XRP cryptocurrencies were used. As control variables, the natural logarithms of interest rates, consumer price index, GDP, and the investor sentiment index (VIX) were used. Data related to cryptocurrencies, VIX index data, and stock index data were obtained from https://www.investing.com/, while data on the consumer price index, GDP, and interest rates were obtained from https://www.worldbank.org/. The natural logarithms of the

obtained data have been continued with working logarithms.

3.2. Method of the Study

To prevent the occurrence of spurious regression, it is important for the series to be stationary. In this context, the ADF (Augmented Dickey-Fuller) unit root test was first used to determine whether the series are stationary. After ensuring the stationarity conditions of the variables at the level and first differences, the Akaike Information Criterion (AIC), Schwarz Information Criterion (BIC), and Hannan-Quinn Criterion (HQ) tests were applied to determine the appropriate lag length in the models. After determining the appropriate lag length, the root and modulus values, which indicate whether the VAR models established for the countries included in the research are stable, were examined. Since all the moduli (absolute values) of the eigenvalues in the VAR models are less than 1, the VAR model is stable. Additionally, the Inverse Roots of the AR characteristic Polynomial, which allows for the same analysis to be interpreted graphically, were analyzed using the unit circle method. In the established VAR models, the presence of autocorrelation was examined using the LM test, and the presence of heteroscedasticity was examined using the Breusch–Pagan/Cook–Weisberg test. Whether there is a long-term cointegration relationship between the variables was examined using the Johansen cointegration test. Additionally, the Granger causality test was applied to examine whether there is causality among the variables.

4. FINDINGS

In this section of the study, the relationships between the variables of the countries included in the research were analyzed and the results were interpreted in detail.

4.1. Descriptive Statistics Test Results

Table 1: Descriptive Statistics for Variables

	Japan				South Korea				Canada			
Variables	**Mean**	**Std. dev.**	**Min.**	**Max.**	**Mean**	**Std. dev.**	**Min.**	**Max.**	**Mean**	**Std. dev**	**Min.**	**Max.**
LSI	.0091	.0464	-.111	.1401	.0036	.0519	-.143	.1336	.0046	.0389	-.195	.099
LBTC	.0489	.2098	-.467	.5328	.0489	.2098	-.467	.5328	.0489	.2098	-.467	.532
LETH	.0588	.3119	-.771	1.142	.0588	.3119	-.771	1.142	.0588	.3119	-.771	1.142
LBNB	.0411	.3132	-1.17	1.556	.0411	.3132	-1.17	1.556	.0411	.3132	-1.17	1.556
LUSDT	.0025	.0108	-.014	.0582	.0025	.0108	-.014	.0582	.0025	.0108	-.014	.0582
LXRP	-1.34	1.437	-5.18	.6830	-1.34	1.625	-5.18	.6830	-1.34	1.437	-5.18	.6830
LCPI	.119	.2966	-.6	.7	.182	1.437	-.7	1	.244	.3947	-.7	1.4
LGDP	.079	1.842	-8.2	5.3	.557	.3817	-3.3	2.1	.159	1.647	-11.6	6.5
LVIX	18.59	7.521	9.51	53.54	18.59	.9151	9.51	53.54	18.59	7.521	9.51	53.54
LIR	.0020	.0201	0	.2	.0202	7.521	-.5	.5	.0429	.2083	-1	1

When examining the descriptive statistics provided in Table 1, it is observed that the variable with the highest average among the three countries is the LVIX index with an average of 18.59, while the variable with the lowest average is LXRP with an average of -1.34. For Japan, the variable with the highest standard deviation is the LVIX index at 7.521, while the variable with the lowest standard deviation is LUSDT at 0.0108. For the South Korean economy, the highest standard deviation is 7.52 with LIR, and the lowest standard deviation is 0.0108 with LUSDT. For the Canadian economy, it is observed that the highest standard deviation is 7.521 with LVIX, and the lowest standard deviation is 0.0025 with LUSDT.

4.2. Unit Root Test Results

The presence of a unit root in the series was examined using the ADF (Augmented Dickey-Fuller) unit root test, which is widely used in the literature, and the results are presented in Table 3..

Table 3: ADF Unit Root Test Results

	Dickey Fuller (ADF)					
	Japan		**South Korea**		**Canada**	
Variables	**I(0) Level**	**I(1) Level**	**I(0) Level**	**I(1) Level**	**I(0) Level**	**I(1) Level**
LSI	-7.904***	-	-7.860***	-	-7.899***	-
LBTC	-6.049***	-	-6.049***	-	-6.049***	-
LETH	-5.955***	-	-5.955***	-	-5.955***	-
LUSDT	-7.284***	-	-7.284***	-	-7.284***	-
LBNB	-5.440***	-	-5.440***	-	-5.440***	-
LXRP	-2.822	-6.937***	-2.822	-6.937***	-2.822	-6.937***
LIR	-6.964***	-	-4.437***	-	-4.657***	-
LCPI	-4.631***	-	-8.306***	-	-6.452***	-
LGDP	-5.753***	-	-4.688***	-	-5.158***	-
LVIX	-3.277**	-	-3.277**	-	-3.277**	-

Note: (***) and (**) indicate significance levels of 1% and 5%, respectively.

Table 3 presents the results of the Augmented Dickey-Fuller (ADF) panel unit root test applied to stationary models for the variables included in the research. When examining the ADF unit root test results, it is observed that the LXRP (Ripple) variable is not stationary at the level for all three countries, but becomes stationary at the I(1) level when first differenced. It is observed that all other variables meet the condition of stationarity at the level. This situation allows for the analysis of long-term

relationships using the Johansen cointegration test, the determination of causality relationships using the Granger causality test, and the analysis of dynamic relationships using the VAR (Vector Autoregression) model and the VECM (Vector Error Correction Model).

4.3. Delay Length Test Results

An important test that needs to be conducted before starting the Johansen cointegration test is the determination of the lag length. In this context, the appropriate lag length was determined using the Akaike Information Criterion (AIC), Schwarz Information Criterion (BIC), and Hannan-Quinn Criterion (HQ), and the results are presented in Table 4. Similarly, the stability of the appropriate lagged VAR models determined for the models was tested using the roots of the AR characteristic polynomial presented in Table 4 and the tests provided in Figures 1, 2, and 3.

Table 4: Test Results of Delay Length and Inverse Roots of the AR Characteristic Polynomial

	Delay Length				Inverse Roots of the AR Characteristic Polynomial	
Country	**Delay**	**AIC**	**HQIC**	**SBIC**	**Kitchen**	**Modulus**
Japan	0	16.7667	16.8747	17.0339	.9720333	.972393
	1	3.13641*	4.32412*	6.07472*	.9444878	.951582
	2	3.15311	5.42057	8.76262	.477657	.841834
South Korea	0	11.0104	11.1184	11.2775	.9762508	.976314
	1	-1.43062	-.235717*	1.5265*	.9341213	.934121
	2	-1.43319*	.847981	4.21222	.786209	.788187
					.7377536	.737754
					…**	…**
Canada	0	12.5008	12.6088	12.7679	.9131639	.921574
	1	-.332636	.855079*	2.60568*	.9156044	.917958
	2	-.406388	1.86107	5.20312	.8543049	.861095
	3	-.557027	2.79017	7.72368	.5072578	.860361
	4	-.62642*	3.80052	10.3255	…*	…**

Note: (*) Indicates the optimal delay length, while (**) indicates that the root and modulus values continue.

In Table 4, the AIC, HQ, and BIC information criterion values for four lag lengths are provided for all models. In determining the appropriate number of lags, the AIC, HQ, and BIC information criteria must have minimum values. The delay with the highest number of lowest values

provides the most suitable delay. When examining the results presented in Table 4, it is observed that the optimal lag length according to the AIC information criterion is 1 for Japan, 2 for South Korea, and 4 for Canada. It is observed that the optimal lag length for the HQ and BIC criteria is one. In the study, the AIC information criterion, which is widely used in the literature, has been preferred.

In Table 4, the root and modulus values indicating whether the VAR models established for the countries included in the research are stable can be seen. The three dots in the table indicate that the root and modulus values continue. Below, since the entire AR characteristic polynomial's roots are not provided in the table to avoid repetition and excessive space, only the relevant parts are shown within the circle. When the table is examined, it can be said that the VAR model is stable because the moduli (absolute values) of all the eigenvalues in the VAR models are less than 1. The results of the unit circle analysis of the inverse roots of the AR characteristic polynomial, which allows for the same analysis to be interpreted graphically, are also presented in Figures 1, 2, and 3.

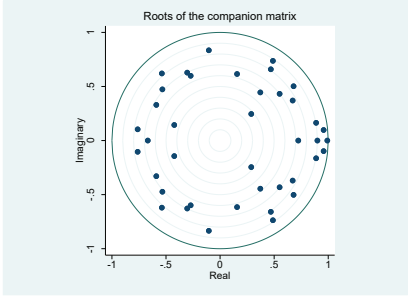


Figure 1. The AR Characteristic Polynomial Inverse Roots (Japan)

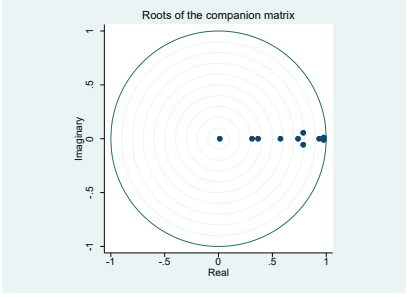


Figure 2. The AR Characteristic Polynomial Inverse Roots (South Korea)

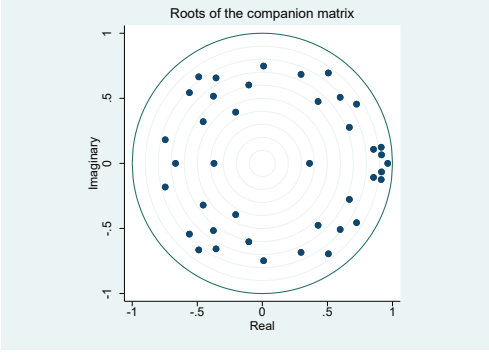


Figure 3. The AR Characteristic Polynomial Inverse Roots (Canada)

When all the figures presented above are examined, it is observed that none of the AR roots lie outside the unit circle. In this case, it most clearly supports that the established VAR models are stationary. Again, whether there is an autocorrelation problem in the established VAR models was examined using the LM test, and whether there is a heteroscedasticity problem was examined using the Breusch–Pagan/Cook–Weisberg test, with the results presented in Table 5.

Table 5: Autocorrelation LM and Breusch–Pagan/Cook–Weisberg Test Results

Country	Autocorrelation LM				Breusch-Pagan / Cook-Weisberg	
	Delay	df	LM_{ist}	Probability Value	chi2	Prob > chi2
Japan	1	100	121.8859	0.05667	1.33	0.2493
	2	100	112.4220	0.18643		
	3	100	137.0663	**0.00822**		
	4	100	117.7362	0.10873		
South Korea	1	100	114.7952	0.14796	0.36	0.5474
Canada	1	100	123.1142	0.05827	1.11	0.2872
	2	100	114.6008	0.15088		
	3	100	150.3574	**0.00085**		
	4	100	106.8577	0.30113		

When examining the LM test statistic results for Japan given in Table 5, it can be said that the error terms exhibit autocorrelation at the first lag level since the probability value (0.00822) is less than the critical value of 0.05. In other words, the H0 hypothesis, which states that there is no autocorrelation, is rejected at this level. At other lag levels (1, 2, 4), the probability values are greater than the 0.05 critical value, so the H0 hypothesis is accepted, and it can be said that the error terms do not show autocorrelation. When examining the LM test statistic results for the South Korea model, since the probability values (0.14796) are greater than the critical value of 0.05, the null hypothesis (H0) is accepted, and it can be said that the error terms do not show autocorrelation. When examining the LM test statistic results for the Canadian model, it can be said that the error terms show autocorrelation at the third lag level because the probability value (0.00085) is less than the critical value of 0.05. In other words, the H0 hypothesis, which states that there is no autocorrelation, is rejected at this level. At other lag levels (1, 2, 4), the probability values are greater than the critical value of 0.05, so the H0 hypothesis is accepted, and it can be said that the error terms do not show autocorrelation. Similarly, when examining the Breusch–Pagan/Cook–Weisberg test results provided in Table 5, the Prob > chi2 value for all models is greater than the critical value of 0.05, so the H0 hypothesis cannot be rejected, and therefore, it can be said that there is no problem of changing variance in the model.

4.4. Johansen Cointegration Test Results

Whether there is a long-term cointegration relationship among the variables was examined using the Johansen cointegration test, and the results are presented in Table 6.

Table 6: Johansen Cointegration Test Results

Country	Eigen Value	Trace Statistics	%95 Critical Value	Maximum Eigen Statistic	%95 Critical Value
Japan	-	370.8849	233.13	97.2656	62.81
	0.63694	273.6193	192.89	76.0252	57.12
	0.54703	197.5941	156.00	53.6985	51.42
	0.42842	143.8956	124.24	47.5548	45.28
	0.39065	96.3408	94.15	35.2011	39.37
	0.30697	**61.1397***	68.52	27.7157	33.46
South Korea	-	295.4348	233.13	79.9306	62.81
	0.55763	215.5042	192.89	74.4752	57.12
	0.53231	**141.0291***	156.00	42.0119	51.42
Canada	-	325.7010	233.13	86.8264	62.81
	0.59523	238.8747	192.89	67.4670	57.12
	0.50479	171.4077	156.00	48.1570	51.42
	0.39446	**123.2507***	124.24	34.2723	45.28

Note: (*) Indicates the appropriate lag length, which has also been tested using the Akaike Information Criterion (AIC).

In Table 6, the lag length, eigenvalue, trace statistic, maximum eigen statistic, and 95% critical values for the models created for the countries included in the research are provided. When examining the results for the Japanese economy, it is observed that the optimum lag length is five according to the trace statistic value and four according to the maximum eigenvalue statistic. Since both the trace statistic value and the maximum eigen statistic value are greater than the critical value, the null hypothesis (H0) stating that there is no cointegration between the series was rejected, and therefore, it was concluded that there is cointegration between the series. When examining the results for the South Korean economy, it was found that the optimum lag length was two, and the null hypothesis (H0) stating that there is no cointegration between the series was rejected because both the trace statistic value and the maximum eigenvalue statistic value were greater than the critical value. Therefore, it was concluded that there is cointegration between the series. When examining the results for the Canadian economy, it is observed that the optimum lag length is three according to the trace statistic value and two according to the maximum

eigen statistic value. Since the statistical values for both lag lengths are greater than the critical values, the H0 hypothesis, which states that there is no cointegration between the series, has been rejected, and therefore it has been concluded that there is cointegration between the series.

4.5. Granger Causality Test Results

In this section of the study, the Granger causality test was applied to determine whether there is causality between the variables, and the results are presented in Table 7.

Table 7: Granger Causality Test Results

Variables	Japan	South Korea	Canada
	Chi-Sq	**Chi-Sq**	**Chi-Sq**
H_0: Bitcoin is not a Granger cause of stock market returns.	3.2994 (0.192)	.09854 (0.754)	2.5772 (0.631)
H_0: Stock market returns are not the Granger cause of Bitcoin.	5.2126 (0.074)	2.7469 (0.097)	3.2808 (0.512)
H_0: Ethereum is not a Granger cause of stock market returns.	.30585 (0.858)	.4566 (0.499)	.98763 (0.912)
H_0: Stock returns are not the Granger cause of Ethereum.	1.4722 (0.479)	.73679 (0.391)	**12.28 (0.012)****
H_0: Tether is not a Granger cause of stock market returns.	**8.1513 (0.017)****	.13718 (0.711)	6.4681 (0.167)
H_0: Stock return is not the Granger cause of Tether.	.79817 (0.671)	.28188 (0.595)	6.6111 (0.158)
H_0: Bine Coin is not the Granger cause of stock market returns.	1.4222 (0491)	3.05 (0.081)	.98175 (0.913)
H_0: The stock market return is not the Granger cause of Bine Coin.	.38731 (0.824)	.7115 (0.399)	**11.503 (0.021)****
H_0: Ripple is not the Granger cause of stock returns.	1.4483 (0.485)	1.3894 (0.239)	1.8752 (0.759)
H_0: Stock return is not the Granger cause of Ripple.	1.1134 (0.573)	.95279 (0.329)	**14.29 (0.006)*****
H_0: Interest rates are not the Granger cause of stock market returns.	4.98 (0.083)	1.7001 (0.192)	4.9851 (0.289)
H_0: Stock market returns are not a Granger cause of interest rates.	2.3206 (0.313)	1.1576 (0.282)	**11.098 (0.025)****
H_0: Inflation is not a Granger cause of stock market returns.	1.1213 (0.571)	2.0842 (0.149)	3.8991 (0.420)
H_0: Stock market returns are not a Granger cause of inflation.	2.3309 (0.312)	**3.9653 (0.046)****	**23.573 (0.000)*****
H_0: GDP is not the Granger cause of stock market returns.	2.9634 (0.227)	.01482 (0.903)	**30.523 (0.000)*****
H_0: Stock market returns are not a Granger cause of GDP.	2.1884 (0.701)	.19788 (0.656)	**11.931 (0.018)****

H_0: The investor sentiment index (VIX) is not a Granger cause of stock market returns.	2.2795 (0.320)	1.687 (0.194)	**14.136 (0.007)*****
H_0: Stock market returns are not the Granger cause of the investor sentiment index (VIX)	.58697 (0.274)	**4.6704 (0.031)****	**13.434 (0.009)*****

Note: The values in parentheses ( ) represent probability values, with (***) and (**) indicating significance at the 1% and 5% levels, respectively.

In Table 7, the Granger causality test results showing whether there is a causal relationship between the variables for the economies of the countries included in the research are presented. When examining the Granger causality test results presented in Table 7, it is observed that for the Japanese economy, there is only a one-way causality from Tether to the Nikkei 225 (N225) index. According to this result, it can be said that the changes occurring in Tether are the cause of the changes in the N225 index. When examining the Granger causality test results for the South Korean economy, it is observed that there is only a one-way causality between the KOSPI index and the inflation rate and investor sentiment (VIX) index. According to this result, it can be said that changes in the KOSPI index are the cause of changes in the inflation rate and the VIX index. When examining the Granger causality test results for the Canadian economy, it is observed that there is a bidirectional causality relationship between GDP and the investor sentiment (VIX) index and the GSPTSE index. According to this result, it can be said that changes in GDP and the VIX index are the cause of changes in the GSPTSE index. Similarly, it is observed that there is a one-way causality between the GSPTSE index and Ethereum, Bine Coin, Ripple, interest rates, and inflation rates. According to this conclusion, it can be said that changes in the GSPTSE index are the cause of changes in Ethereum, Bine Coin, Ripple, interest rates, and inflation rates.

1.5. Analysis of Dynamic Relationships Between Variables Using VAR (Vector Autoregression Model) and VECM (Vector Error Correction Model) Models

In this section of the study, the short-term relationships between the variables were analyzed using the VAR model, and the long-term relationship was analyzed using the VECM model. The results are presented in Tables 8, 9, and 10 provided in Appendix. According to the results of the VAR and VECM models presented in the tables, we evaluate the effects of various cryptocurrencies, economic variables, and financial indicators on stock market returns (LSM). The values in parentheses show the p-values and indicate whether the coefficients are statistically significant. When examining the VAR and VECM test results for the Japanese economy presented in Table 8, it is observed that the effect of LSM in all lag periods

on the dependent variable varies in both positive and negative directions, and it is seen that other variables, except for LBTC, are not statistically significant. Only the first lagged values of LBTC are statistically significant and positively affect D_LSM. This result indicates that the first lag level of LBTC is statistically significant and positively affects D_LSM, showing that the increase in previous period values has a positive impact on D_LSM. The error correction term _ce1, which represents the long-term equilibrium relationship, shows how much of the long-term imbalance is corrected from the previous period. Accordingly, since the _ce1 coefficient is -1.487, negative, and statistically significant (p=0.000), it can be said that the long-term imbalance is rapidly corrected. The _ce2 error correction term is not statistically significant (p>0.05), indicating that these components do not contribute to the long-term equilibrium correction. The R^2 value given in the table (58.8%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value (P>chi2=0.0104).When examining the VAR and VECM model results for the Bitcoin variable, it is observed that in the short term, the first lagged value of LBTC and the first and second lagged values of IGDP have a statistically significant effect on D_LBTC. It is observed that the other variables do not have a statistically significant effect on LBTC. The error correction term _ce2 coefficient being negative and statistically significant indicates the presence of a long-term equilibrium in the model. It is observed that the _ce1 coefficient is not statistically significant. In this case, it indicates that these components do not contribute to long-term equilibrium correction.The R^2 value given in the table (24.38%) indicates that the model has a low level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, the probability value is less than the 5% critical value (P>chi2=0.0417), so it can be said that the model generally exhibits good fit.

When examining the VAR and VECM model results showing short- and long-term relationships for the Ethereum variable, it is observed that only the first lagged value of LBTC has a statistically significant and positive effect on D_EHT, while the other variables do not have a significant effect. The error correction term _ce1 coefficient being positive and statistically significant indicates the presence of a long-term equilibrium in the model. It is observed that the _ce2 coefficient is not statistically significant. In this case, it indicates that these components do not contribute to long-term equilibrium correction.The R^2 value given in the table (20.70%) indicates that the model has a low explanatory power. Similarly, when examining the

Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits good fit since the probability value is equal to the 5% critical value (P>chi2=0.050). When examining the VAR and VECM model results showing short- and long-term relationships for the Tether variable, it is observed that the first lag of LSM, the first and second lags of LBTC, the first and second lags of LEHT, the second lag of LUSDT itself, the second lag of LBNB, the first and second lags of CP, and the second lag of LVIX have a statistically significant effect on D_LUSDT. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_LUSDT either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (40.96%) indicates that the model has a moderate explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, the probability value (P>chi2=0.000) is less than the 5% critical value, so it can be said that the model generally exhibits a good fit.

When examining the VAR and VECM model results showing short- and long-term relationships for the Bine Coin variable, it is observed that the second lagged value of LUSDT, the first lagged value of LXRP, the second lagged values of itself, and CP are statistically significant on D_LBNB. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in their previous period values affects D_LBNB either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (21.10%) indicates that the model has a low explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that the model is not significant because the probability value is greater than the 5% critical value (P>chi2=0.1680). When examining the VAR and VECM model results showing short and long-term relationships for the Ripple variable, it is observed that the first lagged value of LBCT, the second lagged value of LUSDT, the first and second lagged values of LXRP, and the second lagged value of CP are statistically significant on D_LXRP. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_LXRP either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium

in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (92.32%) indicates that the model has a very high level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally shows a good fit because the probability value is less than the 5% critical value (P>chi2= 0.0000).

When examining the VAR and VECM model results showing short- and long-term relationships for the interest rate (LIR) variable, it is observed that only the first lagged values of LSM have a statistically significant and positive effect on D_LIR. It can be said that the statistical significance and positive effect of this variable at the lag level indicate that the increase in previous period values raises D_LIR. It is observed that the error correction terms _ce1 and _ce2, which represent the long-term equilibrium relationship, have a statistically significant effect on the return to long-term equilibrium. Accordingly, the statistical significance of the _ce1 and _ce2 coefficients indicates the presence of long-term equilibrium in the model. The R^2 value given in the table (10.02%) indicates that the model has a very low explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that the model is not significant because the probability value is greater than the 5% critical value (P>chi2=0.9513). When examining the VAR and VECM model results showing short- and long-term relationships for the consumer price index (LCPI) variable, it is observed that the first lag of LUSDT, the second lag of LXRP, and the first and second lags of LCPI are statistically significant on D_LCPI. The statistical significance, both negative and positive, of these variables at their lag levels indicates that the increase in previous period values affects D_LCPI either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model, in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (30.06%) indicates that the model has a low explanatory power. Similarly, when examining the Chi-Square test results, the probability value is less than the 5% critical value (p> chi2= 0.0030), indicating that it generally exhibits good fit.

When examining the VAR and VECM model results showing short- and long-term relationships for the Gross Domestic Product (GDP) variable, it is observed that the first lag of LBTC, the first lag of LBNB, and the first and second lags of itself and LVIX have a statistically significant effect on D_GDP. The significance of these variables at different lag levels indicates that the increase in previous period values affects D_LGDP

either positively or negatively. The error correction term _ce1 coefficient being positive and statistically significant indicates the presence of long-term equilibrium in the model. It is observed that the _ce2 coefficient is not statistically significant. In this case, it indicates that these components do not contribute to long-term equilibrium correction. The R^2 value given in the table (48.30%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value (p> chi2=0.0000). When examining the VAR and VECM model results showing short- and long-term relationships for the Investor Sentiment Index (LVIX) variable, it is observed that only the first lagged value of LVIX itself has a statistically significant and negative effect on D_LVIX. The positive nature of this VIX variable at the first lag levels indicates that the increase in previous period values positively affects D_LVIX. The statistical significance and positive impact of the _ce1 error correction terms, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicate the presence of long-term equilibrium in the model. The R^2 value given in the table (55.84%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, the probability value is less than the 5% critical value (P>chi2= 0.1758), so it can be said that the model generally exhibits a good fit.

When examining the VAR and VECM test results for the South Korean economy presented in Table 9, it is observed that the effect of all lag periods of LSM on the dependent variable varies in both positive and negative directions, and most of these effects are not statistically significant. Only the first lag of LXRP, the second lag of IR, the first and second lags of CPI, and the second lag of VIX are statistically significant on D_LSM. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_LSM either negatively or positively. The error correction terms _ce1 and _ce2 indicate a long-term equilibrium relationship, with the _ce1 coefficient being negative and statistically significant, and the _ ce2 coefficient being positive and significant ($p < 0.10$), demonstrating the existence of a long-term equilibrium in the model. The R^2 value given in the table (61.98%) indicates that the model has a moderately high explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant or not, it can be said that it generally shows a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results for the Bitcoin variable, it is observed that, in the short term, none of the other variables

have a statistically significant effect on D_LBTC except for LBTC's own first lagged value. Similarly, it is observed that the error correction terms indicating the long-term relationship are also not significant. In this case, it indicates that there is no long-term equilibrium in the model. The R^2 value given in the table (63.67%) indicates that the model has a moderately high explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value.

When examining the VAR and VECM model results showing short- and long-term relationships for the Ethereum variable, it is observed that, according to both the VAR model and the VECM model results, the variables do not have a statistically significant effect on D_EHT. The R^2 value given in the table (41.57%) indicates that the model has a low explanatory power. Similarly, when examining the Chi-Square test results, it can be said that there is generally a good fit since the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short- and long-term relationships for the Tether variable, it is observed that the first, second, and third lagged values of LBTC, LEHT, LUSDT, and CPI, and the first lagged value of LBNB, are statistically significant on D_LUSDT. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_LUSDT either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (38.59%) indicates that the model has a low explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant or not, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value.

When examining the VAR and VECM model results showing short- and long-term relationships for the Bine Coin variable, it is observed that the first and second lagged values of LBNB and the first lagged value of IR are statistically significant on D_LBNB. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values has affected D_LBNB either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (39.08%) indicates that the model has a low

level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short- and long-term relationships for the Ripple variable, it is observed that the second lagged value of LUSDT and the first and second lagged values of LXRP are statistically significant on D_LXRP. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_LXRP either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model, in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (31.86%) indicates that the model has a very low explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it does not generally exhibit a good fit because the probability value is greater than the 5% critical value (P>chi2= 0.1142).

When examining the VAR and VECM model results showing short- and long-term relationships for the interest rate (IR) variable, it is observed that the first and second lagged values of LSM, IR, and VIX, and the second lagged value of CPI are statistically significant on D_IR. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_IR either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (34.35%) indicates that the model has a low level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short- and long-term relationships for the (CPI) variable, it is observed that the first, second, and third lagged values of LBTC, LEHT, and CPI, the fourth lagged values of LXRP and IR, and the first lagged value of VIX are statistically significant on D_CPI. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in their previous period values affects D_CPI either negatively or positively. It is observed that the error correction terms _ce2, which represent the long-term equilibrium relationship, have a statistically significant effect on the return to long-term equilibrium. Accordingly, the

positive and statistically significant nature of the _ce2 coefficient ($p<0.05$) indicates the presence of long-term equilibrium in the model. The R^2 value given in the table (28.20%) indicates that the model has a low explanatory power. Similarly, when examining the Chi-Square test results, it can be said that the model generally exhibits a good fit because the probability value is less than the 5% critical value.

When examining the VAR and VECM model results showing short- and long-term relationships for the Gross Domestic Product (GDP) variable, it is observed that only the second lagged values of GDP have a statistically significant and positive effect on D_GDP. The positive nature of the second lag levels of this GDP variable indicates that the increase in previous period values positively affects D_GDP. The presence of statistically significant and negative ($p<0.05$) effects of the _ce2 error correction terms, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicates the existence of long-term equilibrium in the model. The R^2 value given in the table (57.72%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally shows a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short- and long-term relationships for the investor sentiment index (VIX) variable, it is observed that only the first lagged value of VIX has a statistically significant and negative effect on D_VIX. The negative values of this VIX variable at the first lag levels indicate that the increase in previous period values negatively affects D_VIX. The statistically significant and negative ($p<0.10$) effect of the _ce2 error correction terms, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicates the presence of long-term equilibrium in the model. The R^2 value given in the table (58.25%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, the probability value is greater than the 5% critical value ($P>chi2= 0.1758$), so it can be said that the model does not generally exhibit a good fit.

When examining the VAR and VECM test results for the Canadian economy presented in Table 10, it is observed that the first, second, third, and fourth lagged values of LSM and LBNB, and the first lagged value of LETH have statistically significant positive and negative effects on D_LSM. The significance of these variables at their lag levels indicates that the increase in previous period values affects D_LSM either positively or negatively. The error correction terms _ce1, which represent the long-term equilibrium relationship, have a statistically significant and negative effect

on the return to long-term equilibrium ($p<0.01$), while the error correction term _ce3 has a significant and positive effect, indicating the presence of long-term equilibrium in the model. The R^2 value given in the table (77.31%) indicates that the model has a high level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results for the Bitcoin variable, it is observed that all lagged values of LUSDT and LXRP, as well as the first lagged value of LBTC and the first and second lagged values of LETH, have a statistically significant effect on D_LBTC. The significance of these variables at lag levels indicates that the increase in previous period values affects D_BTC either positively or negatively. The _ce3 error correction terms, which represent the long-term equilibrium relationship, have a statistically significant and positive effect ($p<0.05$) on the return to long-term equilibrium, while the _ce4 error correction term has a significant and negative effect ($p<0.01$), indicating the presence of long-term equilibrium in the model. The R^2 value given in the table (63.32%) indicates that the model has a moderately high explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value.

When examining the VAR and VECM model results showing short- and long-term relationships for the Ethereum variable, it is observed that the first lag of LETH, the third and fourth lags of LXRP, and the second lag of GDP are statistically significant on D_LEHT. The statistical significance, both negative and positive, of these variables at their lag levels indicates that the increase in previous period values affects D_LEHT either negatively or positively. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (63.79%) indicates that the model has a moderately high explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short and long-term relationships for the Tether variable, it is observed that the fourth lag of LSM, the first and second lags of LBTC, all lag values of LETH, and the first, third, and fourth lag values of LUSDT are statistically significant on D_LUSDT. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase

in previous period values affects D_LUSDT either negatively or positively. The statistically significant and negative ($p<0.01$) effect of the _ce4 error correction terms, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicates the presence of long-term equilibrium in the model. The R^2 value given in the table (73.17%) indicates that the model has a high level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant or not, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value.

When examining the VAR and VECM model results showing short- and long-term relationships for the Bine Coin variable, it is observed that the second lagged values of LUSDT, LXRP, and GDP are statistically significant on D_LBNB. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_LBNB either negatively or positively. The statistically significant and positive ($p<0.01$) effect of the _ce3 error correction terms, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicates the presence of long-term equilibrium in the model. The R^2 value given in the table (60.67%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short- and long-term relationships for the Ripple variable, it is observed that the second lagged values of LSM and GDP, the first lagged value of LBTC, the first and second lagged values of LETH, and the fourth lagged value of LXRP are statistically significant on D_LXRP. The statistical significance of these variables at their lag levels, both negatively and positively, indicates that the increase in previous period values affects D_LXRP either negatively or positively. The statistical significance ($p<0.01$, $p<0.05$) of the error correction terms _ce3 and _ce4, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicates the presence of long-term equilibrium in the model. The R^2 value given in the table (43.18%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally shows a good fit since the probability value is less than the 5% critical value.

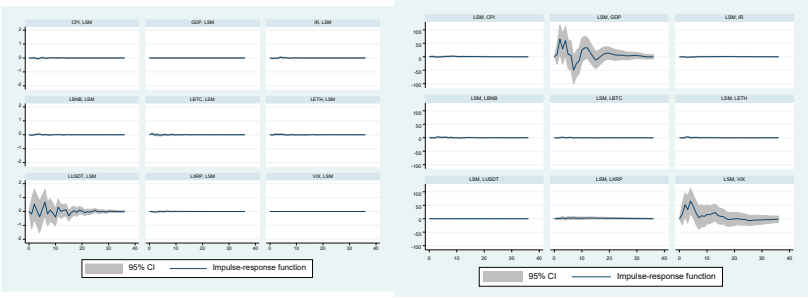
When examining the VAR and VECM model results showing short- and long-term relationships for the interest rate (IR) variable, it is observed that the first lags of LETH and LXRP, the second lags of GDP and VIX, all lags of LUSDT, and the first, second, and fourth lags of IR and CPI

are statistically significant on D_IR. The statistical significance of these variables at their lag levels, whether negative or positive, indicates that the increase in previous period values affects D_IR either negatively or positively. The statistically significant ($p<0.01$, $p<0.10$) effects of the error correction terms _ce2 and _ce3, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicate the presence of long-term equilibrium in the model. The R^2 value given in the table (69.26%) indicates that the model has a high level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short- and long-term relationships for the (CPI) variable, it is observed that only the fourth lagged value of LEHT and the first lagged value of LUSDT have statistically significant and negative effects on D_CPI. The statistical significance and negative direction of these variables at their lag levels indicate that the increase in previous period values negatively affects D_CPI. The statistical insignificance of the error correction terms indicates that there is no long-term equilibrium in the model; in other words, the error correction terms do not have a statistically significant effect on the return to long-term equilibrium. The R^2 value given in the table (54.28%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results, it can be said that the model generally exhibits a good fit because the probability value is less than the 5% critical value.

When examining the VAR and VECM model results showing short- and long-term relationships for the Gross Domestic Product (GDP) variable, it is observed that the first lagged values of LSM and GDP, and the first and second lagged values of LBTC, LBNB, and VIX have a statistically significant effect on D_GDP. The positive and negative values of this GDP variable at different lag levels indicate that the increase in previous period values affects D_GDP both positively and negatively. The presence of statistically significant and positive ($p<0.01$) effects of the _ce2 error correction terms, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicates the existence of long-term equilibrium in the model. The R^2 value given in the table (81.70%) indicates that the model has a very high explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant, it can be said that it generally exhibits a good fit because the probability value is less than the 5% critical value. When examining the VAR and VECM model results showing short- and long-term relationships for the investor sentiment index (VIX) variable, it is observed that LSM

has a statistically significant effect on D_VIX with its first and second lags, LETH with its first lag, LUSDT and LXRP with their second, third, and fourth lags, and CPI with all its first lagged values. The positive and negative levels of this VIX variable indicate that the increase in previous period values affects D_VIX both positively and negatively. The statistical significance ($p<0.01$, $p<0.05$) of the error correction terms _ce1 and _ce2, which represent the long-term equilibrium relationship, on the return to long-term equilibrium indicates the presence of long-term equilibrium in the model. The R^2 value given in the table (43.32%) indicates that the model has a moderate level of explanatory power. Similarly, when examining the Chi-Square test results that indicate whether the model is significant or not, the probability value is greater than the 5% critical value (P>chi2=0.1340), so it can be said that the model does not generally exhibit a good fit.

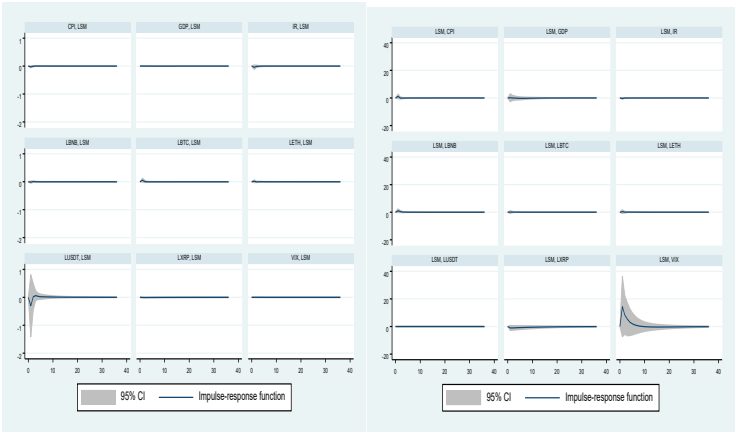
After obtaining the VAR models, the impulse response functions were examined. "Impulse response functions reflect the impact of a one standard deviation shock in one of the random error terms on the current and future values of the endogenous variables (Elmastaş Gültekin and Aktürk Hayat, 2016: 621)."



Graph 1: Impact-Response Graph for the Japanese Economy

In Graph 1, the effects of shocks in the variables (CFI, GDP, IR, LBNB, LBTC, LUSDT, LETH, LXRP, VIX) included in the research on the Japanese economy on stock market returns (LSM) are observed. Each panel determines how the response of stock returns to a shock in a different variable changes over time. The black lines represent the impulse-response functions, while the gray shaded areas represent the 95% confidence intervals. When examining Graph 1, it can be said that the shocks occurring in the other independent variables and control variables, except for LUSDT, have a minimal and statistically insignificant effect on the Nikkei 225 (N225). However, it is observed that a shock in Tether (LUSDT) immediately creates a strong impact on the Nikkei 225 (N225) in the initial periods, causing a significant fluctuation in stock market returns. In the

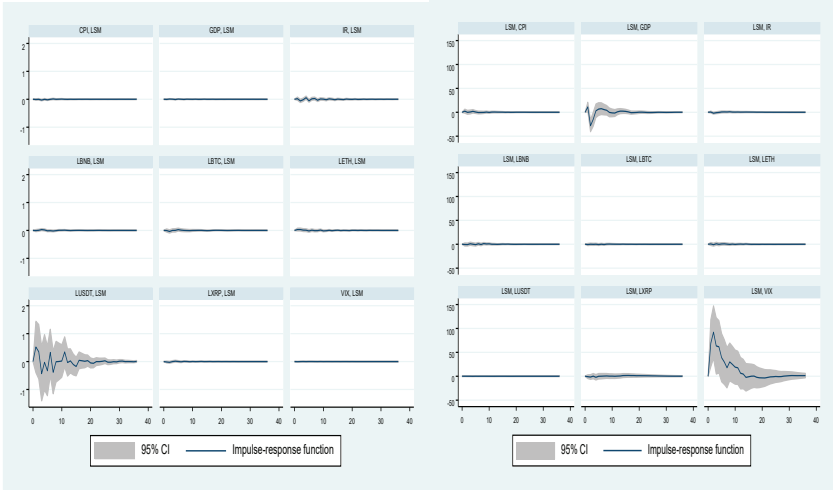
first few periods, it is observed that the response of stock market returns is quite volatile and largely negative in these fluctuations. This indicates that sudden changes in Tether lead to significant uncertainties in stock returns. Over time, the impact of these shocks on Tether begins to diminish as the fluctuations decrease. After a few periods, it is observed that the effects of Tether on stock returns stabilize and the initial significant impact of the shock nearly completely dissipates. To summarize the impact of Tether on stock returns, we can say that sudden changes in Tether initially created high volatility in stock returns, but these effects diminished over time and stabilized in the long run. The initially observed high volatility indicates that the markets reacted quickly and strongly to changes in Tether, but this reaction was not sustainable and the market adapted to these changes over time. When examining the impact of a shock on other variables in the Nikkei 225 (N225) shown in Graph 1, it is observed that a shock does not have a significant effect on the consumer price index, interest rates, Binance Coin, Bitcoin, Ethereum, Tether, and Ripple. It is observed that the Nikkei 225 (N225) has a short-term volatile effect on GDP due to a shock. In the first few periods, a noticeable fluctuation is observed, but over time these effects diminish. The initial volatility observed indicates that economic growth is sensitive to stock market shocks in the short term. Similarly, it is observed that a shock to the Nikkei 225 (N225) has a significant effect on the VIX, with this effect showing considerable fluctuations in the initial periods, but these fluctuations diminish and disappear over time.



Graph 2: Impact-Response Graph for the South Korean Economy

In Graph 2, the effects of shocks in the variables (CFI, GDP, IR, LBNB, LBTC, LUSDT, LETH, LXRP, VIX) included in the research on the South Korean economy on stock market returns (LSM) are shown. Each panel

determines how the response of stock returns to a shock in a different variable changes over time. The black lines represent the impulse-response functions, while the gray shaded areas represent the 95% confidence intervals. When examining Graph 2, it is observed that only a shock in the LUSDT cryptocurrency has a significant effect on the KORE KOSPI (KOSPI) index, while other variables do not have a significant impact. The impact of a shock in LUSDT on the KORE KOSPI (KOSPI) index is minimal, with the initial reaction being negative, but over time, this effect diminishes and becomes neutral. When examining the impact of a shock on the KORE KOSPI (KOSPI) index shown in Graph 4 on other variables, it is observed that there is a significant and pronounced effect only on the VIX index, while there is no significant and pronounced effect on the other variables. It is observed that the shocks occurring in the KORE KOSPI (KOSPI) index lead to a significant negative reaction in the VIX index, and this reaction diminishes and disappears over time.



Graph 3: Impact-Response Graph for the Canadian Economy

In Figure 3, the effects of shocks in the variables (CFI, GDP, IR, LBNB, LBTC, LUSDT, LETH, LXRP, VIX) included in the research on the Canadian economy on stock market returns (LSM) are observed. Each panel determines how the response of the S&P/TSX (GSPTSE) index to a shock in a different variable changes over time. The black lines represent the impulse-response functions, while the gray shaded areas represent the 95% confidence intervals. When examining Graph 3, it is observed that only a shock in the LUSDT cryptocurrency has a significant effect on the S&P/TSX (GSPTSE) index, while other variables do not have a significant effect.

Especially, the initial reaction on the S&P/TSX (GSPTSE) index is negative, but over time this effect diminishes and becomes neutral. This indicates that changes in LUSDT negatively affect the S&P/TSX (GSPTSE) index in the short term, but this effect dissipates in the long term. These findings suggest that cryptocurrencies like Tether (LUSDT) can play a significant role in stock market returns and that these effects can change over time. When examining the impact of a shock on the S&P/TSX (GSPTSE) index as shown in Graph 3, it is observed that only the GDP and VIX indices are significantly and distinctly affected, while the other variables are not noticeably impacted. GDP shows a negative and significant initial response to a shock in the S&P/TSX (GSPTSE) index, but it stabilizes over time. This indicates that stock market shocks have a particularly negative impact on economic output in the short term. The Volatility Index (VIX) shows a significant reaction to a shock in the S&P/TSX (GSPTSE) index. Its initial response is negative and significant, this effect diminishes over time but remains negative for a long period. The gray shaded area represents the 95% confidence interval, and within this confidence interval, the VIX's response is significant. These findings indicate that market volatility significantly affects stock returns and that investors are sensitive to market volatility.

5. CONCLUSION

The aim of this study is to analyze the impact of cryptocurrency markets, particularly major cryptocurrencies such as Bitcoin, Ethereum, Tether, Ripple, and Binance Coin, on the stock market performances of leading countries like Japan, Canada, and South Korea. For this purpose, monthly data from April 2016 to June 2024 has been used for the economies of Japan, South Korea, and Canada. The long-term cointegration relationship between the variables was examined using the Johansen cointegration test, and the test concluded that there is a long-term relationship. The causal relationship between the variables was examined using the Granger causality test, and as a result of the test, it was determined that in the Japanese economy, there is a one-way causality from Tether to the Nikkei 225 (N225) index. For the South Korean economy, it was determined that there is a unidirectional causality relationship only between the KOSPI index and the inflation rate and investor sentiment (VIX) index, while for the Canadian economy, a bidirectional causality relationship was identified between GDP and the investor sentiment (VIX) index and the GSPTSE index. Similarly, it has been concluded that there is a one-way causality between the GSPTSE index and Ethereum, Bine Coin, Ripple, interest rates, and inflation rates. The short-term relationship between the variables was examined using the VAR model, while the long-term relationship was analyzed using the VECM model. According to the VAR model results, for

the Japanese economy, the effect of LSM on the dependent variable in all lag periods varies in both positive and negative directions, and it is observed that other variables, except for LBTC, are not statistically significant. According to the VECM model results, a long-term relationship has been identified. It has been determined that there is a significant and positive relationship between Bitcoin and the Nikkei 225 (N225) index at the first lag level in the short term, and a significant and negative relationship in the long term. In the short term, no significant relationship was found between Ethereum and the Nikkei 225 (N225) index, while in the long term, a positive and significant relationship was identified. Between Tether and the Nikkei 225 (N225), there is a positive and significant relationship at the first lag level in the short term, while no relationship has been detected between the variables in the long term. While no significant relationship was found between Binecoin and Ripple with the Nikkei 225 (N225) index in the short term, a significant relationship was found only with Ripple in the long term. In the control variables, a significant relationship was found between interest rates and the Nikkei 225 (N225) index in both the short and long term. No significant relationship was found between the consumer price index and investor sentiment with the Nikkei 225 (N225) index in both the short and long term. Between GDP and the Nikkei 225 (N225) index, it was concluded that there is only a long-term relationship. When the results were examined for the South Korean economy, it was found that cryptocurrencies do not have a significant relationship with the KOSPI index in either the short or long term. It has been determined that there is a short-term relationship between the interest rate and the KOSPI index among the control variables, but no relationship in the long term. It was concluded that there is no significant relationship between the consumer price index, investor sentiment, and GDP with KOSPI in the short term, but there is a significant relationship in the long term. When the results were examined for the Canadian economy, it was found that Bitcoin's impact on the S&P/TSX (GSPTSE) index was significant in the long term but not significant in the short term.it was determined that neither Ethereum had a significant impact on the S&P/TSX (GSPTSE) index in the short or long term, while Tether and Binecoin had a significant impact on the S&P/TSX (GSPTSE) index in the long term. It has been concluded that Ripple's impact on the S&P/TSX (GSPTSE) index is significant both in the short term at the second lag level and in the long term. It has been determined that the impact of interest rates and GDP on the S&P/TSX (GSPTSE) is significant in the long term but not significant in the short term. No significant relationship was found between the consumer price index and the S&P/TSX (GSPTSE) index in either the long or short term. It has been determined that there is a significant relationship between the investor sentiment index and the S&P/TSX (GSPTSE) index in both the

short and long term. In future studies, the relationship between variables can be compared with different countries and/or regions at varying levels of development. By adding more variables, studies can be conducted using different analysis methods.

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APPENDIX

Table 8: VAR and VECM Model Test Results for the Japanese Economy

Japan	Variables	VAR Model										VECM Model				
		SM	BTC	ETH	USDT	BNB	XRP	IR	CPI	GDP	VIX	Variables	Coef.	Std. Error	z-Statistic	Prob.
	D_LSM											**D_LSM**				
	LSM (L1)	-.1343 (0.279)	.0602 (0.055)	-.0279 (0.251)	.2615 (0.619)	.0100 (0.539)	.0060 (0.698)	-.3237 (0.129)	-.0251 (0.132)	-.0004 (0.988)	-.0001 (0.905)	_ce1	-1.487	.3731	-3.99	0.000***
	LSM (L2)	-.0988 (0.332)	.0427 (0.173)	-.0122 (0.504)	-.3201 (0.529)	-.0083 (0.605)	-.0094 (0.548)	.0123 (0.954)	.0129 (0.435)	-.0044 (0.168)	.0004 (0.710)	_ce2	.0235	.0549	0.43	0.668
	_cons	-.0025 (0.879)														
		R^2=0.5888														
		chi2=122.5701, P>chi2=0.0104														
	D_LBTC											**D_LBTC**				
	LBTC (L1)	.9768 (0.080)	.0933 (0.507)	-.0214 (0.844)	2.304 (0.328)	.0836 (0.253)	-.1065 (0.128)	-1.212 (0.204)	.0672 (0.369)	.02941 (0.039)	.0076 (0.110)	_ce1	1.314	1.633	0.80	0.421
	LBTC (L2)	-.0333 (0.942)	-.1151 (0.412)	.1241 (0.131)	.0529 (0.981)	.0401 (0.579)	.07345 (0.294)	.6103 (0.523)	.0567 (0.447)	-.0471 (0.001)	-.0077 (0.102)	_ce2	-.6526	.2403	-2.72	0.007***
	_cons	-.0258 (0.727)														
		R^2 = 0.2438														
		chi2=31.26817, P>chi2=0.0417														
	D_LETH											**D_LETH**				
	LETH (L1)	.4796 (0.570)	.3541 (0.097)	.0093 (0.955)	-1.709 (0.632)	-.1237 (0.265)	-.7321 (0.613)	.1718 (0.130)	.0243 (0.259)	.0051 (0.478)	-.0217 (0.094)	_ce1	4.650	2.477	1.88	0.061*
	LETH (L2)	.4122 (0.551)	-.1888 (0.374)	.1794 (0.150)	-1.844 (0.593)	.0064 (0.953)	1.681 (0.246)	.1164 (0.303)	-.0194 (0.374)	.0012 (0.859)	-.0016 (0.908)	_ce2	-.0332	.3647	-0.09	0.927
	_cons	.0211 (0.508)														
		R^2 = 0.2070														
		chi2=25.32299, P>chi2=0.050														
	D_LUSDT											**D_LUSDT**				
	LUSDT (L1)	.05782 (0.008)	.0098 (0.073)	-.00782 (0.068)	.1219 (0.187)	.0007 (0.795)	.0030 (0.287)	-.0123 (0.742)	-.0057 (0.050)	.0001 (0.916)	.0003 (0.179)	_ce1	-.0837	.0642	-1.30	0.193
	LUSDT (L2)	-.01650 (0.357)	-.0142 (0.010)	.0154 (0.000)	-.1957 (0.028)	-.0031 (0.251)	-.0052 (0.065)	.0330 (0378)	.0048 (0.097)	.0003 (0.498)	-.0003 (0.079)	_ce2	.0004	.0095	0.04	0.970
	_cons	-.0003 (0.917)														
		R^2 =0.4096														
		chi2= 67.2843, P>chi2=0.000														

Note: ( ) the values within parentheses in the thesis represent probability values, with significance levels of 1%, 5%, and 10% indicated by ***, **, and * respectively.

Table 9: VAR and VECM Model Test Results for South Korea

D_LBNB											**D_LBNB**				
LBNB (L1)	-2.706 (0.348)	-.1673 (0.436)	.1185 (0.477)	-.8255 (0.818)	.1868 (0.081)	.0967 (0.941)	-.5463 (0.708)	-.0190 (0.868)	.02209 (0.311)	.0110 (0.130)	_ce1	2.161	2.494	0.87	0.386
LBNB (L2)	-.5015 (0.471)	-.2368 (0.269)	.0248 (0.843)	6.729 (0.053)	-.1566 (0.143)	.2411 (0.029)	-.0934 (0.949)	-.2485 (0.029)	.00569 (0.796)	-.0064 (0.370)	_ce2	-.2709	.3672	-0.74	0.461
_cons	.0001 (0.999)														
R^2=0.2110															
chi2=25.93462, P>chi2=0.1680															
D_LXRP											**D_LXRP**				
LXRP (L1)	.3957 (0.717)	.6441 (0.020)	.1671 (0.435)	-2.249 (0.627)	.5945 (0.000)	-.1970 (0.170)	-.9698 (0.604)	.1907 (0.194)	-.02631 (0.348)	.0081 (0.386)	_ce1	6.623	3.389	1.95	0.051*
LXRP (L2)	1.0446 (0.243)	-.1431 (0.603)	.2504 (0.121)	-11.984 (0.007)	.2775 (0.044)	-.0307 (0.829)	.8592 (0.647)	.3062 (0.037)	.0264 (0.350)	-.0034 (0.713)	_ce2	.0018	.4990	0.00	0.997
_cons	.0061 (0.889)														
R^2=0.9232															
chi2= 1166.818, P>chi2=0.0000															
D_IR											**D_IR**				
IR (L1)	.0981 (0.094)	.0112 (0.445)	.00203 (0.859)	-.1416 (0.567)	.0013 (0.856)	.0019 (0.804)	-.0532 (0.595)	-.0041 (0.599)	-.0005 (0.702)	.0003 (0.503)	_ce1	-3.572	1.974	-1.81	0.070*
IR (L2)	.0751 (0.117)	-.0086 (0.560)	.0001 (0.998)	-.0534 (0.823)	-.0001 (0.992)	-.0025 (0.733)	.0205 (0.838)	-.0007 (0.925)	-.0001 (0.931)	-.0004 (0.323)	_ce2	.9223	.2906	3.17	0.002***
_cons	.00601 (0.440)														
R^2=0.1002															
chi2=10.79609, P>chi2=0.9513															
D_CPI											**D_CPI**				
CPI (L1)	.1717 (0.817)	.1269 (0.499)	.1182 (0.416)	6.999 (0.026)	-.1448 (0.121)	-.1524 (0.119)	.9267 (0.466)	.2278 (0.022)	.0143 (0.450)	.0007 (0.912)	_ce1	-2.434	2.173	-1.12	0.263
CPI (L2)	-.6190 (0.309)	-.0712 (0.703)	.1516 (0.167)	1.262 (0.677)	.1690 (0.070)	-.0731 (0.449)	.6209 (0.626)	.1950 (0.050)	.0214 (0.265)	-.0023 (0.708)	_ce2	.2817	.3199	0.88	0.379
_cons	.1212 (0.220)														
R^2= 0.3006															
chi2=41.69938, P>chi2=0.0030															
D_GDP											**D_GDP**				
GDP (L1)	6.59660 (0.106)	1.963 (0.057)	-.0280 (0.972)	-8.767 (0.867)	-.68702 (0.181)	-.9275 (0.084)	-.0742 (0992)	.2169 (0.693)	.8172 (0.000)	.0769 (0.027)	_ce1	133.9	41.39	3.24	0.001***

Note: ( ) the values within parentheses in the thesis represent probability values, with significance levels of 1%, 5%, and 10% indicated by ***, **, and * respectively.

	GDP (L2)	-1.674 (0.617)	-.6399 (0.534)	.0377 (0.950)	4.4883 (0.788)	.7021 (0.172)	.6461 (0.224)	-2.248 (0.748)	-.4070 (0.457)	-.3039 (0.004)	-.0808 (0.019)	_ce2	6.058	6.093	0.99	0.320
	_cons	.0960 (0.860)														
	R^2=0.4830															
	chi2= 90.62434, P>chi2=0.0000															
	D_VIX											**D_VIX**				
	VIX (L1)	-4.292 (0.780)	-2.4934 (0.521)	4.544 (0.131)	-10.46 (0.872)	-2.202 (0.254)	-.9554 (0.636)	-3.249 (0.902)	1.792 (0.386)	-.1483 (0.706)	.5762 (0.000)	_ce1	109.4	44.51	2.46	0.014**
	VIX (L2)	18.427 (0.143)	3.045 (0.431)	-.3994 (0.860)	-47.49 (0.449)	2.702 (0.162)	-1.205 (0.546)	-23.40 (0.375)	-2.607 (0.205)	-.0439 (0.912)	.16588 (0.202)	_ce2	-.1388	6.553	-0.02	0.983
	_cons	5.536 (0.007)														
	R^2=0.5584															
	chi2= 122.6676, P>chi2=0.0000															

Note: ( ) the values within parentheses in the thesis represent probability values, with significance levels of 1%, 5%, and 10% indicated by ***, **, and * respectively.

Table 9: VAR and VECM Model Test Results for South Korea

	Variables	VAR Model										VECM Model				
		SM	BTC	ETH	USDT	BNB	XRP	IR	CPI	GDP	VIX	Variables	Coef.	Std. Error	z-Statistic	Prob.
South Korea	**D_LSM**											**D_LSM**				
	LSM (L1)	.0844 (0.462)	-.0272 (0.339)	-.0274 (0.219)	.0364 (0.946)	.0089 (0.548)	-.0314 (0.080)	.0289 (0.429)	.0431 (0.002)	.0175 (0.032)	-.0008 (0.515)	_ce1	-1.329	.1849	-7.19	0.000***
	LSM (L2)	-.1469 (0.159)	.0086 (0.786)	.0231 (0.248)	-.3003 (0.573)	-.0084 (0.613)	.0075 (0.644)	-.0956 (0.014)	-.0320 (0.019)	-.0194 (0.009)	.0020 (0.076)	_ce2	.1061	.0140	7.56	0.000**
	_cons	-.0289 (0.094)														
	R^2=0.6198															
	chi2=135.28, (P>chi2= 0.0000)															
	D_LBTC											**D_LBTC**				
	LBTC (L1)	-.4824 (0.362)	-.3350 (0.011)	.0472 (0.646)	-.2277 (0.926)	.0335 (0.623)	-.0945 (0.253)	-.1631 (0.333)	-.0325 (0.621)	.0085 (0.822)	.0037 (0.515)	_ce1	1.126	.8517	1.32	0.186
	LBTC (L2)	.3123 (0.510)	-.0478 (0.739)	.0605 (0.506)	.6245 (0.796)	-.0311 (0.680)	.0351 (0.637)	.0463 (0.793)	.0147 (0.812)	-.0171 (0.610)	-.0005 (0.911)	_ce2	-.0665	.0646	-1.03	0.303
	_cons	.0101 (0.684)														
	R^2=0.3467															
	chi2=44.055, (P>chi2= 0.0000)															
	D_LETH											**D_LETH**				

	LETH (L1)	-.2156 (0.768)	.2295 (0.207)	-.2003 (0.160)	-3.650 (0.283)	-.1031 (0.275)	-.1271 (0.266)	-.1419 (0.542)	.1410 (0.120)	.0844 (0.106)	-.0021 (0.788)	_ce1	.5018	1.178	0.43	0.670
	LETH (L2)	.3555 (0.601)	-.0984 (0.633)	.1413 (0.278)	-.9119 (0.793)	-.0415 (0.701)	-.0139 (0.896)	.0188 (0.941)	-.0949 (0.287)	-.0526 (0.274)	.0062 (0.402)	_ce2	.0228	.0894	0.26	0.798
	_cons	.0206 (0.548)														
	R^2 =0.4157															
	chi2= 59.038, (P>chi2= 0.0000)															
	D_LUSDT											**D_LUSDT**				
	LUSDT (L1)	-.0052 (0.814)	.0135 (0.014)	-.0162 (0.000)	-.1793 (0.081)	.0031 (0.271)	-.0044 (0.201)	.0076 (0.209)	-.0083 (0.002)	.0008 (0.602)	-.0000 (0.919)	_ce1	.0051	.0356	0.15	0.884
	LUSDT (L2)	.0118 (0.494)	-.0130 (0.013)	.0155 (0.000)	-.1890 (0.032)	-.0049 (0.071)	-.0033 (0.225)	-.0071 (0.268)	.0042 (0.060)	.0010 (0.410)	-.0000 (0.653)	_ce2	-.0028	.0027	-1.05	0.294
	_cons	-.0004 (0.664)														
	R^2 =0.3859															
	chi2=52.157, (P>chi2= 0.0000)															
	D_LBNB											D_LBNB				
	LBNB (L1)	.3041 (0.692)	-.0747 (0.695)	.2165 (0.147)	-3.310 (0.353)	-.5312 (0.000)	.1860 (0.121)	-.4146 (0,.089)	.1416 (0.137)	-.0369 (0.500)	.0122 (0.138)	_ce1	1.040	1.235	0.84	0.400
	LBNB (L2)	.5306 (0.427)	-.1711 (0.399)	-.0589 (0.645)	4.666 (0.171)	.2365 (0.026)	-.1552 (0.140)	.0043 (0.986)	-.0473 (0.589)	.0309 (0.513)	-.0029 (0.682)	_ce2	-.0588	.0937	-0.63	0.530
	_cons	-.0001 (0.997)														
	R^2 =0.3908															
	chi2= 53.249, (P>chi2= 0.0000)															
	D_LXRP											**D_LXRP**				
	LXRP (L1)	-.1410 (0.880)	.3272 (0.158)	-.2608 (0.151)	6.211 (0.152)	-.0392 (0.745)	-.2596 (0.075)	.2436 (0.412)	-.1581 (0.172)	.1029 (0.122)	-.0024 (0.811)	_ce1	-1.366	1.502	-0.91	0.363
	LXRP (L2)	.9586 (0.277)	-.1745 (0.514)	.2771 (0.101)	-7.966 (0.077)	-.0619 (0.659)	.3031 (0.029)	-.0425 (0.897)	.0808 (0.484)	-.0757 (0.225)	-.0009 (0.922)	_ce2	.0428	.1140	0.38	0.707
	_cons	.0330 (0.451)														
	R^2 =0.1886															
	chi2= 19.295, (P>chi2= 0.1142)															
	D_IR											**D_IR**				
	LIR (L1)	-.5389 (0.056)	.0508 (0.468)	.0188 (0.731)	-1.070 (0.413)	.0118 (0.744)	.0041 (0.924)	-.5999 (0.000)	-.0122 (0.727)	-.0032 (0.870)	-.0065 (0.032)	_ce1	.0348	.4532	0.08	0.939
	LIR (L2)	.4788 (0.053)	-.0507 (0.498)	-.0430 (0.364)	1.048 (0.406)	-.0297 (0.450)	-.0318 (0.412)	.2889 (0.002)	.0587 (0.070)	.0018 (0.915)	.0081 (0.003)	_ce2	.0031	.0344	0.09	0.928
	_cons	.0042 (0.746)														
	R^2 =0.4435															

	chi2= 66.139, (P>chi2= 0.0000)															
	D_CPI											**D_CPI**				
	CPI (L1)	.5267 (0.573)	-.7820 (0.001)	.5271 (0.004)	-4.108 (0.345)	.0845 (0.484)	-.0546 (0.709)	-.3355 (0.260)	.0603 (0.603)	.0364 (0.585)	-.0255 (0.011)	_ce1	-1.927	1.506	-1.28	0.201
	CPI (L2)	.9618 (0.194)	.6494 (0.004)	-.3326 (0.019)	1.201 (0.751)	-.1696 (0.150)	.2175 (0.062)	.6788 (0.014)	-.3263 (0.001)	-.0054 (0.917)	.0113 (0.160)	_ce2	.2366	.1143	2.07	0.038**
	_cons	.0172 (0.694)														
	R^2=0.2820															
	chi2=32.602, (P>chi2= 0.0020)															
	D_GDP											**D_GDP**				
	GDP (L1)	-1.785 (0.285)	.3006 (0.469)	-.2675 (0.411)	7.377 (0.342)	.0327 (0.879)	-.0337 (0.897)	.5020 (0.345)	-.2727 (0.189)	.0377 (0.752)	-.0098 (0.586)	_ce1	4.189	2.690	1.56	0.119
	GDP (L2)	-.6923 (0.635)	-.1209 (0.785)	.0054 (0.984)	-7.145 (0.338)	.1851 (0.425)	-.0739 (0.747)	.1855 (0.733)	.2144 (0.263)	-.2210 (0.033)	-.0038 (0.812)	_ce2	-.3940	.2042	-1.93	0.054*
	_cons	.7076 (0.003)														
	R^2=0.5772															
	chi2= 132.42, (P>chi2= 0.7049)															
	D_VIX											**D_VIX**				
	VIX (L1)	-17.06 (0.170)	-1.155 (0.709)	-.0145 (0.995)	60.77 (0.294)	-.1939 (0.904)	-1.132 (0.561)	2.658 (0.502)	.3410 (0.825)	-.3081 (0.729)	-.2286 (0.089)	_ce1	26.34	20.04	1.31	0.189
	VIX (L2)	15.28 (0.198)	3.416 (0.343)	-.4823 (0.832)	-42.09 (0.488)	-1.617 (0.393)	2.370 (0.204)	1.606 (0.717)	.2488 (0.873)	.2806 (0.739)	.1351 (0.299)	_ce2	-2.634	1.522	-1.73	0.083*
	_cons	4.366 (0.026)														
	R^2=0.5825															
	chi2= 135.32, (P>chi2= 0.1758)															

Note: ( ) the values within parentheses in the thesis represent probability values, with significance levels of 1%, 5%, and 10% indicated by ***, **, and * respectively.

Table 10: VAR and VECM Model Test Results for Canada

	Variables	**VAR Model**										**VECM Model**				
		SM	BTC	ETH	USDT	BNB	XRP	IR	CPI	GDP	VIX	Variables	Coef.	Std. Error	z-Statistic	Prob.
Canada	**D_LSM**											**D_LSM**				
	LSM (L1)	.8523 (0.012)	.0139 (0.654)	-.1068 (0.011)	.3326 (0.693)	-.0700 (0.002)	-.0208 (0.185)	.0060 (0.845)	.0573 (0.007)	.0070 (0.143)	-.0026 (0.037)	_ce1	-2.526	.4396	-5.75	0.000***
	LSM (L2)	.5665 (0.026)	-.0272 (0.449)	-.0413 (0.187)	1.021 (0.119)	-.0594 (0.011)	-.0546 (0.003)	-.0321 (0.371)	.0511 (0.006)	.0012 (0.759)	-.0018 (0.172)	_ce2	-.0199	.0307	-0.65	0.517
	LSM (L3)	.2719 (0.068)	-.0292 (0.299)	-.0023 (0.909)	.4967 (0.330)	-.0295 (0.094)	-.0402 (0.019)	-.0553 (0.078)	.0060 (0.643)	.0036 (0.273)	-.0002 (0.939)	_ce3	.1405	.0533	2.63	0.008***

	LSM (L4)	.2585 (0.029)	-.0237 (0.315)	-.0079 (0.632)	.4845 (0.234)	-.0289 (0.042)	-.0412 (0.003)	-.0561 (0.026)	.0101 (0.353)	.0022 (0.405)	-.0008 (0.536)	_ce4	.1981	1.025	0.19	0.847
	_cons	.0010 (0.792)														
	R² =0.7731															
	chi2= 197.67, (P>chi2= 0.0000)															
	D_LBTC											**D_LBTC**				
	LBTC (L1)	-.0003 (1.000)	-.3018 (0.097)	-.6092 (0.013)	13.28 (0.07)	-.0202 (0.878)	-.2023 (0.021)	-.0429 (0.805)	-.0565 (0.608)	.0050 (0.882)	-.0004 (0.956)	_ce1	-.4361	2.572	-0.17	0.865
	LBTC (L2)	.3759 (0.801)	-.0536 (0.799)	-.3931 (0.032)	11.26 (0.003)	-.0808 (0.553)	-.1864 (0.073)	-.2696 (0.204)	-.0301 (0.757)	.0349 (0.138)	.0066 (0.413)	_ce2	-.332	.1797	-1.85	0.064
	LBTC (L3)	-.5094 (0.559)	-.1647 (0.317)	.0296 (0.809)	8.713 (0.004)	.0089 (0.931)	-.1341 (0.164)	.0089 (0.961)	-.0391 (0.576)	-.0217 (0.251)	-.0064 (0.464)	_ce3	.7203	.3123	2.31	0.021**
	LBTC (L4)	.6738 (0.305)	-.0068 (0.959)	.0291 (0.752)	6.796 (0.003)	.0165 (0.834)	-.1375 (0.073)	.0209 (0.881)	-.0146 (0.808)	.0167 (0.262)	.0069 (0.316)	_ce4	-16.47	5.998	-2.75	0.006***
	_cons	-.0042 (0.854)														
	R² =0.6332															
	chi2= 100.11 (P>chi2= 0.0000)															
	D_LETH											**D_LETH**				
	ETH (L1)	-2.201 (0.451)	.2829 (0.287)	-.6689 (0.063)	-4.598 (0.523)	-.0100 (0.958)	-.0039 (0.976)	-.0051 (0.984)	-.2799 (0.125)	-.0050 (0.902)	-.0024 (0.824)	_ce1	3.301	3.761	0.88	0.380
	ETH (L2)	.6070 (0.780)	.0509 (0.869)	-.3770 (0.159)	-3.193 (0.569)	-.0218 (0.912)	-.1264 (0.423)	-.4934 (0.109)	-.0602 (0.707)	.0671 (0.046)	-.0006 (0.956)	_ce2	.1251	.2628	0.48	0.634
	ETH (L3)	-.6699 (0.599)	-.1858 (0.440)	.1356 (0.449)	-.2805 (0.949)	.0072 (0.962)	-.2431 (0.096)	-.2410 (0.369)	-.0423 (0.704)	-.0091 (0.748)	.0021 (0.872)	_ce3	-.2586	.4567	-0.57	0.571
	ETH (L4)	.4963 (0.608)	.1922 (0.320)	-.1163 (0.393)	.4225 (0.899)	-.0147 (0.899)	.2824 (0.012)	-.2997 (0.146)	-.0031 (0.972)	.0125 (0.567)	.0020 (0.842)	_ce4	-2.032	8.771	-0.23	0.817
	_cons	.0264 (0.434)														
	R² =0.6379															
	chi2= 102.16, (P>chi2= 0.0000)															
	D_LUSDT											**D_LUSDT**				
	LUSDT (L1)	-.0474 (0.522)	.0260 (0.000)	-.0282 (0.002)	.5521 (0.003)	-.0005 (0.908)	.0024 (0.472)	.0016 (0.801)	-.0073 (0.113)	.0013 (0.213)	.0004 (0.103)	_ce1	.1099	.0955	1.15	0.250
	LUSDT (L2)	.0166 (0.763)	.0167 (0.032)	-.0164 (0.016)	.2342 (0.100)	-.0039 (0.432)	.0052 (0191)	.0040 (0.605)	-.0037 (0.361)	.0000 (0.962)	.0004 (0.163)	_ce2	-.0101	.0066	-1.51	0.130
	LUSDT (L3)	.0468 (0.148)	.0061 (0.314)	-.0078 (0.085)	.1866 (0.092)	.0020 (0.592)	-.0016 (0.653)	.0022 (0.739)	-.0035 (0.213)	.0007 (0.298)	.0001 (0.616)	_ce3	.0195	.0116	1.69	0.091
	LUSDT (L4)	-.0426 (0.099)	.0059 (0.247)	-.0082 (0.024)	-.2198 (0.013)	-.0031 (0.312)	.0002 (0.941)	-.0034 (0.536)	.0021 (0.378)	-.0005 (0.364)	-.0001 (0.712)	_ce4	-1.608	.2227	-7.22	0.000***

	_cons	-.0008 (0.322)													
		R^2=0.7317													
		chi2= 158.14, P>chi2=0.0000													
	D_LBNB											**D_LBNB**				
	LBNB (L1)	-3.326 (0.286)	-.2971 (0.296)	-.5795 (0.131)	1.179 (0.878)	-.1548 (0.450)	-.0414 (0.774)	-.0046 (0.987)	.0907 (0.642)	.0341 (0.438)	-.0005 (0.963)	_ce1	3.486	4.019	0.87	0.386
	LBNB (L2)	-2.536 (0.275)	.0037 (0.991)	-.2867 (0.316)	10.05 (0.093)	.0354 (0.868)	-.4895 (0.004)	-.0423 (0.897)	-.0535 (0.754)	.0661 (0.066)	.0084 (0.503)	_ce2	-.1144	.2808	-0.41	0.684
	LBNB (L3)	-.9129 (0.503)	-.2734 (0.287)	.2360 (0.218)	3.162 (0.498)	-.1092 (0.499)	.0084 (0.957)	-.0206 (0.943)	-.0415 (0.727)	-.0031 (0.918)	.0132 (0.354)	_ce3	.9549	.4880	1.96	0.050**
	LBNB (L4)	.8843 (0.376)	.0191 (0.924)	-.0584 (0.677)	-3.306 (0.335)	-.0006 (0.996)	-.0209 (0.857)	.0697 (0.743)	-.0353 (0.700)	.0190 (0.400)	-.0006 (0.950)	_ce4	-3.037	9.372	-0.32	0.746
	_cons	-.0223 (0.537)														
		R^2=0.6067														
		chi2=89.481, P>chi2=0.0000														
	D_LXRP											**D_LXRP**				
	LXRP (L1)	-5.685 (0.151)	.9300 (0.010)	-1.070 (0.028)	23.38 (0.017)	.1074 (0.679)	-.2697 (0.139)	-.2831 (0.426)	-.1878 (0.447)	.0853 (0.127)	.0032 (0.825)	_ce1	4.794	5.098	0.94	0.347
	LXRP (L2)	-5.392 (0.068)	.6349 (0.128)	-.8475 (0.020)	10.07 (0.185)	.1792 (0.506)	.0865 (0.685)	-.1874 (0.653)	-.0078 (0.971)	.0915 (0.045)	-.0123 (0.444)	_ce2	-.3157	.3562	-0.89	0.347
	LXRP (L3)	-2.175 (0.208)	.0518 (0.874)	-.2804 (0.248)	7.745 (0.191)	.1318 (0.520)	-.1968 (0.321)	.3279 (0.367)	.0799 (0.597)	-.0260 (0.501)	.0093 (0.607)	_ce3	1.391	.6189	2.25	0.025**
	LXRP (L4)	1.314 (0.305)	.2162 (0.398)	.2082 (0.248)	-9.210 (0.036)	-.1410 (0.359)	.3385 (0.023)	-.1743 (0.523)	.0013 (0.991)	.0298 (0.305)	-.0060 (0.658)	_ce4	-39.71	11.88	-3.34	0.001***
	_cons	.0071 (0.876)														
		R^2=0.4318														
		chi2=61.956, P>chi2=0.0033														
	D_IR											**D_IR**				
	IR (L1)	-.8971 (0.573)	-.2047 (0.158)	.3927 (0.045)	-4.640 (0.238)	.0948 (0.365)	.1985 (0.007)	-.7317 (0.000)	-.2075 (0.037)	.0475 (0.035)	-.0112 (0.060)	_ce1	1.419	2.052	0.69	0.489
	IR (L2)	-1.597 (0.179)	-.0374 (0.824)	.1098 (0.452)	-2.808 (0.359)	.0745 (0.492)	.1279 (0.137)	-.5175 (0.002)	-.1950 (0.026)	.0372 (0.042)	-.0135 (0.038)	_ce2	.2386	.1434	1.66	0.096*
	IR (L3)	-.4688 (0.500)	-.0187 (0.886)	.0710 (0.468)	-3.804 (0.110)	-.0648 (0.432)	.0939 (0.239)	.2183 (0.136)	-.0792 (0.193)	-.0116 (0.455)	.0026 (0.718)	_ce3	-.6523	.2492	-2.62	0.009**
	IR (L4)	.2432 (0.642)	-.0741 (0.479)	-.0128 (0.861)	-4.051 (0.024)	.0424 (0.500)	-.0399 (0.513)	-.1979 (0.076)	-.1098 (0.023)	.0183 (0.123)	.0017 (0.749)	_ce4	1.681	4.786	0.35	0.725
	_cons	.0044 (0.809)														

	R^2=0.6926															
	chi2=130.68, P>chi2=0.0000															
	D_CPI											**D_CPI**				
	CPI (L1)	-1.706 (0.674)	.0269 (0.942)	-.4232 (0.396)	-18.47 (0.065)	.3040 (0.254)	-.1095 (0.558)	-.3137 (0.390)	-.3861 (0.128)	.0452 (0.430)	.0006 (0.964)	_ce1	4.868	5.223	0.93	0.351
	CPI (L2)	-.8488 (0.779)	-.3921 (0.359)	.0642 (0.863)	-4.908 (0.528)	.2396 (0.386)	-.3076 (0.160)	-.6051 (0.157)	-.2400 (0.281)	-.0215 (0.646)	-.0023 (0.884)	_ce2	-.0217	.3649	-0.06	0.952
	CPI (L3)	.3012 (0.865)	-.0698 (0.834)	.3082 (0.215)	-2.905 (0.632)	.1489 (0.478)	-.2609 (0.199)	-.3385 (0.364)	-.1200 (0.438)	.0076 (0.847)	-.0004 (0.981)	_ce3	.4969	.6341	0.78	0.433
	CPI (L4)	.6874 (0.615)	.1400 (0.608)	-.4099 (0.033)	3.177 (0.498)	-.0105 (0.949)	.1793 (0.261)	.0534 (0.854)	.0041 (0.973)	.0064 (0.836)	-.0046 (0.749)	_ce4	17.90	12.17	1.47	0.142
	_cons	.0183 (0.696)														
	R^2=0.5428															
	chi2=68.868, P>chi2=0.0000															
	D_GDP											**D_GDP**				
	GDP (L1)	16.89 (0.091)	-2.464 (0.007)	-.2206 (0.858)	21.11 (0.392)	2.058 (0.002)	-.0132 (0.977)	-1.037 (0.249)	-.3645 (0.559)	.2493 (0.077)	-.0934 (0.013)	_ce1	-5.299	12.87	-0.41	0.681
	GDP (L2)	-1.955 (0.793)	-1.968 (0.062)	-1.228 (0.180)	16.73 (0.383)	1.226 (0.072)	.1895 (0.725)	-1.500 (0.154)	-.2763 (0.615)	-.0342 (0.766)	-.2269 (0.000)	_ce2	3.656	.8995	4.07	0.000***
	GDP (L3)	-1.484 (0.734)	-.5981 (0.468)	-.1123 (0.855)	7.394 (0.621)	0.479 (0.926)	-.5718 (0.253)	.6003 (0.513)	-.2513 (0.510)	-.0356 (0.715)	-.0624 (0.173)	_ce3	-.3478	1.563	-0.22	0.824
	GDP (L4)	2.535 (0.465)	.2559 (0.712)	.1105 (0.821)	-2.319 (0.845)	.1893 (0.649)	.5966 (0.140)	-.9699 (0.189)	.1869 (0.557)	.0409 (0.603)	.0550 (0.133)	_ce4	-34.13	30.01	-1.14	0.255
	_cons	-.0008 (0.994)														
	R^2=0.8170															
	chi2=258.99, P>chi2=0.0000															
	D_VIX											**D_VIX**				
	VIX (L1)	-147.6 (0.005)	1.497 (0.753)	14.48 (0.024)	-104.9 (0.415)	4.699 (0.170)	-.2324 (0.923)	1.482 (0.752)	-5.923 (0.069)	.6488 (0.379)	-.0183 (0.925)	_ce1	221.3	67.20	3.29	0.001***
	VIX (L2)	-78.26 (0.044)	5.828 (0.290)	7.697 (0.108)	-206.3 (0.039)	3.187 (0.370)	5.505 (0.051)	2.614 (0.634)	-8.242 (0.004)	-.1485 (0.805)	.3351 (0.114)	_ce2	.8907	4.695	0.19	0.850
	VIX (L3)	-19.60 (0.389)	4.288 (0.318)	2.040 (0.524)	-156.5 (0.045)	2.454 (0.364)	6.244 (0.017)	4.553 (0.342)	-3.428 (0.085)	.0012 (0.998)	.1899 (0.428)	_ce3	-15.98	8.159	-.196	0.050**
	VIX (L4)	14.29 (0.427)	-4.132 (0.250)	-2.573 (0.309)	-140.17 (0.023)	-2.980 (0.167)	-6.145 (0.003)	-5.560 (0.146)	-3.454 (0.037)	-.1073 (0.793)	-.2420 (0.203)	_ce4	96.35	156.7	0.61	0.539
	_cons	-.0006 (0.999)														
	R^2=0.4332															

	chi2=44.335, P>chi2=0.1340

Not: ( ) paran tez içerisinde yer alan değerler olasılık değeri olup (***,**) sırasıyla %1 ve %5 önem düzeyinde anlamlılığı ifade eder.