THE RELATIONSHIP BETWEEN THE PREVALENCE OF DEPRESSIVE DISORDERS AND STOCK PRICE VOLATILITY AND RETURN

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Abstract

The purpose of this research is to find out if there is a relationship between the prevalence of depressive disorders and stock price volatility and return. For this purpose, the relationships between the variables are analyzed using the panel data method. The first of the results is that there is a negative bidirectional relationship structure between stock price volatility and the prevalence of depressive disorders. Another result is that stock market returns affect the prevalence of depressive disorders and this interaction has a negative sign. This result can be interpreted as the increase in the stock market return will decrease the prevalence of depressive disorders or the decrease in the stock market return will increase the prevalence of depressive disorders. On the other hand, no causal relationship can be obtained that the prevalence of depressive disorders affects the stock market return. It is thought that the findings obtained are important in terms of revealing the interrelationships of the movements in the returns and volatility of stock markets with the prevalence of depression and their potential to affect each other.

Keywords: behavioral finance, Volatility, Return, Depression, Stock exchange

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DEPRESİF BOZUKLUKLARIN YAYGINLIĞI İLE HİSSE SENEDİ FİYAT OYNAKLIĞI VE GETİRİSİ ARASINDAKİ İLİŞKİ

Özet

Bu araştırmanın amacı, depresif bozuklukların yaygınlığı ile borsa oynaklığı ve getirisi arasında bir ilişki olup olmadığını ortaya çıkarmaktır. Bu amaçla değişkenler arasındaki ilişkiler panel veri yöntemi kullanılarak analiz edilmiştir. Elde edilen sonuçlardan ilki, hisse senedi fiyat oynaklığı ile depresif bozuklukların yaygınlığı arasında çift yönlü negatif bir ilişki yapısının olduğudur. Diğer bir sonuç ise borsa getirilerinin depresif bozuklukların yaygınlığını etkilediği ve bu etkileşimin negatif işaretli olmasıdır. Bu sonuç, borsa getirisindeki artışın depresif bozuklukların yaygınlığını azaltacağı veya borsa getirisindeki azalmanın depresif bozuklukların yaygınlığını artıracağı şeklinde yorumlanabilir. Öte yandan, depresif bozuklukların yaygınlığının borsa getirisini etkilediğine dair herhangi bir nedensellik ilişkisi elde edilememiştir. Elde edilen

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bulguların, hisse senedi piyasalarının getiri ve oynaklığındaki hareketlerin depresyonun yaygınlığı ile ilişkisini ve bu değişkenlerin birbirini etkileme potansiyelini ortaya koyması açısından önemli olduğu düşünülmektedir.

Anahtar Kelimeler: Davranışsal finans, Oynaklık, Getiri, Depresyon, Borsa

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Introduction

Investor behavior is affected by many factors and the results of these behaviors inevitably affect the financial markets. At the same time, investor behavior is also affected by financial markets. The issues related to this dynamic and its components, which mutually affect each other, continue to be a matter of curiosity and are discussed in various scientific studies. Some of the variables that distract the investor from rationality while making a decision include the investor's mood and possible mental disorders. The extent to which the elements that detract from rational decision-making impact the investor's decision-making process leads the investor closer to irrationality. In this sense, it is also important how social mental disorders affect investment behaviors, how investment behaviors and financial markets move, whether the rises and decreases in the returns of financial markets and whether some volatilities in the markets affect the psychological state of investors, and whether they prepare the ground for mental disorders. One of the most frequent mental disorders is depression. From the perspective of all the above-stated reasons, it is interesting to see whether the prevalence of depressive disorders affects the changes in the stock markets and how it does and whether the prevalence of depressive disorders is affected by the changes in the stock markets and its possible consequences. The objective of this study is to understand the relationship between the prevalence of depressive disorders, which are among the mental disorders, and the volatility and return changes of the country's stock markets. The study's findings are likely to add to existing knowledge in the field of behavioral finance.

In order to achieve the aims of the study, 4 null hypotheses are established. These null hypotheses are stated as follows:

H_10: The prevalence of depressive disorders does not Granger cause Stock market volatility

H_20: Stock market volatility does not Granger cause the prevalence of depressive disorders

H_30: The prevalence of depressive disorders does not Granger cause the Stock market return

H_40: Stock market return does not Granger cause the prevalence of depressive disorders

The validity of the hypotheses is examined within the framework of Granger causality analysis. In addition, the relations between the variables are tried to be analyzed by creating separate models. In the first model, the prevalence of depressive disorders and stock market volatility are determined as an independent variable and a dependent variable respectively. The stock price volatility is the independent variable in the second model, whereas the prevalence of depressive disorders is the dependent variable. In the third model, the stock market return is defined as an independent variable, while the prevalence of depressive disorders is defined as a dependent variable.

A. DEPRESSION

In this section, mental disorders, especially depression, are discussed with their basic features within the framework of basic studies in the literature.

Depression is a major mental disorder that is chronic, recurrent, cause severe job losses, creates an economic or social burden on human health. It is the primary cause of disability globally and adds to the global illness burden. It also severely affects daily functions, education, and social relationships. In addition to genetic transmission, demographic factors such as economic situation, unemployment, age, gender, marital status and education, and environmental events such as war, mental traumas, migration can cause depression (Kılıç & Uluğ, 2021; WHO, 2021).

The typical age of beginning of depression is in one's mid-twenties. Women are nearly twice as likely as males to suffer from depression at some point in their life (Malhi & Mann, 2018).

People who suffer from depression are more likely to be female, younger, have a lower education level, have a lower household income, and are less likely to be married than people who do not suffer from depression, according to a recent study. People who are depressed are more likely to have comorbid diseases and have a higher risk of cardiovascular disease. In males, depression has been linked to an increased risk of death from any cause as well as cardiovascular disease, regardless of socio-demographic characteristics, lifestyle factors, or health status (Meng et al., 2020).

According to the Health Metrics and Evaluation Institute data, depression affects roughly 280 million individuals worldwide (WHO, 2021). The twelve - month prevalence of major depressive disorders varies widely by country, although it is typically approximately 6%. Depression affects 15-18% of people at some point in their lives (Malhi & Mann, 2018). A chronic course of depression affects about 30% of depressed patients (Murphy & Byrne, 2012), with a 12-month prevalence of 1.5 percent for chronic depression (Blanco et al., 2010). The following bout of recurrent depression tends to be more severe, with more intense pessimistic and suicidal thoughts with each new episode (Ivanets et al., 2020). When compared to non-chronic depression, patients with chronic depression have earlier depressed symptoms, greater rates of psychiatric comorbidity, and a more complicated treatment path (e.g., higher suicide rates) (Köhler et al., 2019). Considering the worst scenario that may occur as a result of depression, suicide is the fourth leading cause of death among those aged 15 to 29. It is well known that depression can lead to suicide; roughly 700,000 people die by suicide each year (WHO, 2021).

Depression is a significant medical condition that affects your feelings, thoughts, and behaviors. People who suffer from depression are perpetually downcast and depressed, and they lose interest in previously cherished activities. However, sadness is not the same as depression (Torres, 2020). Normal mood changes and short-term emotional reactions to everyday hardships are not the same as depression (WHO, 2021). The DSM-5 (Diagnostic and Statistical Manual of Mental Disorders-5th Edition) gives the following criteria for determining a diagnosis of depression. The person must experience five or more symptoms during a two-week period, with at least one of them being sad mood or lack of interest or

pleasure. Other symptoms of depression include changes in appetite, difficulties sleeping or sleeping too much, increased weariness or lack of energy, psychomotor slowness or agitation, feelings of worthlessness or guilt, difficulty thinking, focusing, or making decisions, and thoughts of suicide or death. These symptoms must produce clinically substantial discomfort or impairment in social-occupational or other crucial areas of functioning in order to be diagnosed as depression (American Psychiatric Association, 2013).

In the cognitive schema of depression, the individual has negative cognitive patterns about himself, his life, and the future. The depressed individual sees himself as worthless, inadequate, or undesirable. Secondly, the person perceives the relationships and experiences with the environment negatively and thinks that the world is an unsafe place. Third, the individual has negative views about the future. The person thinks that the troubles or difficulties experienced at that moment will last forever (Batur & Demir, 2009).

All of a depressed person's negative experiences are often attributed to a psychological, moral, or physical flaw. Because of these shortcomings, he feels he is an undesired and useless person. That's why he constantly criticizes himself. He feels he lacks the characteristics necessary for happiness and personal value. In reality, sad people have a poor perception of their relationship with their surroundings. He sees the world as a barrier between him and his life ambitions. If the depressed person can be convinced to propose less negative alternatives, he or she may come to recognize that his or her prior negative interpretations were incorrect. In this approach, he will be able to see how he has manipulated the facts to create unfavorable outcomes(Arkar, 1992).

The reflections of this cognitive schema of depression in the field of finance suggest the following. The depressed individual's mental distress, deterioration in attention and performance, and difficulties in making decisions may adversely affect his choices in the financial field. Losses on his investments can both trigger him to criticize himself more and increase his negative interpretation of his experiences. An irrationally negative view of life and relationships with the environment can lead to irrational financial investments by depressed people, similar to a self-fulfilling prophecy. When financial loss is experienced, the depressed individual may think that the environment represents a defeat for him.

B. LITERATURE REVIEW

Some significant studies in the literature on the association between mental disorders, particularly depression, and economic variables and financial behaviors are presented in this section.

Kramer and Weber (2012) found that people with seasonal affective disorder (SAD) in the United States exhibit seasonally varying financial risk aversion tendencies. While those with the seasonal affective disorder (SAD) do not show any difference in summer when compared to those who do not, it is shared in this study that they show stronger tendencies to avoid risk and make safe choices in winter. In addition, another important finding in this study is that the behavioral tendency of the determined winter months was revealed to be caused by depression.

The relationship between investors' mental health characteristics (depression, paranoia, schizophrenia, etc.) and investment performance has been studied by Patterson and Daigler (2014), and the importance of studying the relationship between mental disorders and financial outcomes for later researchers has been emphasized in this study. The results of the study reveal that people seeking careers in financial investment exhibit significantly higher levels of paranoia (paranoia) and psychopathic deviance (psychopathic deviance) than the average person. In addition, it is stated in this study that such abnormal personality traits are higher in finance employees than the general population, and that there are links between personality traits and some financial success indicators such as portfolio diversification, realized risk, return and risk-adjusted return.

While economic crises affect mental health, the reflection of the thinking errors of the depressed individual on financial preference and the depression itself may have economic reflections. Treatment costs, suicide-related death costs, and workplace costs due to low functionality have all been studied in the literature as part of the economic reflections of depression (Greenberg et al., 2015). However, limited research has been found on the financial behaviors of depressed people and the financial consequences of these behaviors.

Chang et al. (2016) examined the connection between economic situations and postpartum depression (PPD-postpartum depression). It is stated as the results of this study that postpartum depression is associated with the unemployment rate, consumer price index, and gross domestic product, which are economic indicators.

Senarathne and Perera (2021) looked into whether depression and anxiety affect stock market investing in the United States. The results of this study, in which depression and anxiety were measured by the number of searches for terms related to these concepts on Google, show that stock market gains are positively and strongly connected to depression and anxiety when the stock market is rising in value. Furthermore, it was discovered in this study that depression and anxiety reduce as investors' returns increase in a balanced market, whereas depression and anxiety increase when investors' returns are less than or equal to the risk-free rate.

Economic considerations are said to have an impact on mental health. Economic crisis effects such as unemployment, greater workload or job reorganization, and reduced staff and compensation, according to existing research, may be substantial stresses that significantly influence mental health. Depression appears to be the most frequent mental condition, particularly among men in their forties and fifties. Suicide rates among men appear to be on the rise, especially in countries with no public welfare or troubled family connections. All of these findings must be carefully considered by both governments, which are cutting resources for public health rather than investing in it, and psychiatric associations, which must develop and implement appropriate strategies to address and manage this type of depression epidemic brought on by the economic downturn. They strongly advise policymakers to address potential health externalities associated with inadequate social protection systems, given that existing data suggest that the crisis' impact may have been minimized in countries with higher social protection expenditure (Marazziti et al., 2021).

C. MATERIALS AND METHODS

In accordance with the purpose of the study, stock market volatility and return and the prevalence of depressive disorders are determined as the variables of this study.

The values of the stock market volatility and return variables are obtained from the Data Bank Global Financial Development page of the World Bank web portal (Worldbank, 2022). These values are in the form of the annual average volatility and return rate of the national stock market index of the country respectively.

Data on the prevalence of depressive disorders are from a meta-analysis study conducted by Dattani, Ritchie and Roser (2021). The variable of the prevalence of depressive disorders expresses the percentage of this mental disorder seen in society.

Argentina, Australia, Austria, Brazil, Canada, Chile, Finland, France, Germany, Greece, Indonesia, Ireland, Japan, Malaysia, Netherlands, Philippines, Portugal, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, United Kingdom, and Data for United States countries between 1991 and 2019 are included in the analysis. First of all, unit root and causality tests are performed. The panel data method is then used to conduct regression analyses of the variables. Based on the causality analysis, regression models are created by determining the dependent and independent variables, and the results are obtained by analyzing these models.

D. RESULTS

The variables are subjected to unit root tests in the first stage, causality tests in the second stage, and regression analyses in the third stage.

The descriptive statistics of the variables are given in Table 1.

Table 1. Descriptive statistics

	Prevalence of Depressive Disorders	Stock Market Return	Stock Price Volatility
Mean	3.980949	22.07971	22.25883
Median	4.101146	7.818262	19.50460
Maximum	6.444801	4012.566	135.9037
Minimum	2.103356	-51.27143	5.768735
Std. Dev.	0.911355	190.6840	12.93018
Skewness	-0.038939	17.73947	3.289956
Kurtosis	2.343224	338.7282	22.33358
Jarque-Bera	13.74229	3575877.	13103.35
Probability	0.001037	0.000000	0.000000
Sum	3001.636	16626.02	16783.16
Sum Sq. Dev.	625.4172	27343002	125893.7

Unit root tests are conducted to each variable to determine if it is stationary or not. According to the results given in Table 2, since the majority of the p values are found to be significant at this level, it is

understood that all the variables do not contain a unit root without any difference at the fundamental level and show a stationary feature.

Table 2. Unit Root Test Results

	none exogenous variables				constant exogenous variables				constant&lineer trend exogenous variables			
	Statistic	p	C-sec.	Obs	Statistic	p	C-sec.	Obs	Statistic	p	C-sec.	Obs
Variable: Stock Price Volatility												
Method												
Null: Unit root (assumes common unit root process)												
Levin, Lin & Chu t*	-5.41540	0.0000*	26	709	-9.08195	0.0000*	26	708	-7.84661	0.0000*	26	707
Breitung t-stat									-7.51190	0.0000*	26	681
Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin W-stat					-8.95733	0.0000*	26	708	-7.21893	0.0000*	26	707
ADF - Fisher Chi-	79.3058	0.0087**	26	709	180.668	0.0000*	26	708	140.432	0.0000*	26	707
PP - Fisher Chi-square	87.2156	0.0016*	26	728	146.236	0.0000*	26	728	86.1402	0.0020*	26	728
Variable: Stock Market Return												
Method												
Null: Unit root (assumes common unit root process)												
Levin, Lin & Chu t*	-17.9618	0.0000*	26	720	-17.1291	0.0000*	26	725	-10.6021	0.0000*	26	703
Breitung t-stat									-10.8462	0.0000*	26	677
Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin W-stat					-16.2464	0.0000*	26	725	-13.6286	0.0000*	26	703
ADF - Fisher Chi-	382.861	0.0000*	26	720	327.236	0.0000*	26	725	256.981	0.0000*	26	703
PP - Fisher Chi-square	428.684	0.0000*	26	727	326.455	0.0000*	26	727	521.383	0.0000*	26	727
Variable: Prevalence of Depressive Disorders												
Method												
Null: Unit root (assumes common unit root process)												
Levin, Lin & Chu t*	-3.45151	0.0003*	26	646	-3.31192	0.0005	26	646	0.70613	0.7599	26	648
Breitung t-stat									4.13692	1.0000	26	622
Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin W-stat									-1.72701	0.0421**	26	648
ADF - Fisher Chi-	83.8134	0.0034*	26	646	-2.08418	0.0186**	26	646	78.3811	0.0105**	26	648
PP - Fisher Chi-square	64.5344	0.1138	26	728	96.1655	0.0002*	26	646	31.4769	0.9891	26	728

note: p: probability. * : significant at 0.01 level. ** : significant at 0.05 level.*** : significant at 0.1 level.

The results of Dumitrescu & Hurlin (2012) panel causality analysis tests, which allow causality analysis on heterogeneous panel data models, are given in Table 3 and 4. When Table 3 is examined, two-way causality relationships between Stock market volatility and the prevalence of depressive disorders

(p=0.0007 and p=0.0000). On the other hand, according to Table 4, it is determined that there is one-way causality relationships from the stock market return to the prevalence of depressive disorders (p=0.0117).

Tablo 3. The Prevalence Of Depressive Disorders - Stock Price Volatility Pairwise Dumitrescu Hurlin Panel Causality Test Results

Independent Variable	Dependent Variable	Hypothesis	W-Stat.	Zbar-Stat.	p
The prevalence of depressive disorders	Stock price volatility	The prevalence of depressive disorders does not homogeneously cause Stock price volatility (H_10)	3.81011	3.37555	0.0007*
Stock price volatility	The prevalence of depressive disorders	Stock price volatility does not homogeneously cause the prevalence of depressive disorders (H_20)	8.25690	12.6981	0.0000*

note: p: probability. * : significant at 0.01 level. (lag=2)

Tablo 4. The Prevalence Of Depressive Disorders - Stock Market Return Pairwise Dumitrescu Hurlin Panel Causality Test Results

Independent Variable	Dependent Variable	Hypothesis	W-Stat.	Zbar-Stat.	p
The prevalence of depressive disorders	Stock market return	The prevalence of depressive disorders does not homogeneously cause the Stock market return (H_30)	0.57734	-1.58133	0.1138
Stock market return	The prevalence of depressive disorders	Stock market return does not homogeneously cause the prevalence of depressive disorders (H_40)	1.89972	2.52076	0.0117**

note: p: probability. ** : significant at 0.05 level. (lag=1)

Before making a decision for the regression models to be established in panel regression analysis, it is important to understand whether the error terms are random. For this purpose, Hausman (1978) test was conducted for all three models. Analysis results are given in the Table 5. The results of the analysis show that there is no relationship between the independent variables and the error terms for all three models.

Tablo 5. Hausman Test Analysis Results

Independent Variable	Chi-Sq. Statistic	p
Model 1 (Dependent: Stock Price Volatility – Independent: The Prevalence Of Depressive Disorders)	1.267575	0.2602
Model 2 (Dependent = The Prevalence of Depressive Disorders - Independent Stock Price Volatility)	0.481002	0.4880
Model 3 (Dependent = The Prevalence of Depressive Disorders - Independent = Stock Market Return)	0.051067	0.8212

note: p: probability.

Tablo 6. Model 1 (Dependent: Stock Price Volatility – Independent: The Prevalence Of Depressive Disorders) Panel Regression Analysis Results

Dependent Variable	Method	Independent Variable	Coefficient	Std. Error	t-Statistic	p
		c	**27.15646**[*]	1.953521	13.90128	0.0000
		The prevalence of depressive disorders	**-1.230266**[**]	0.478406	-2.571595	0.0103
		Root MSE	11.70039	R-squared	0.180087	
		Mean dependent var	22.25883	Adjusted R-squared	0.147245	
		S.D. dependent var	12.93018	S.E. of regression	11.94034	
	LS	Akaike info criterion	7.836696	Sum squared resid	103221.9	
		Schwarz criterion	8.020731	Log likelihood	-2924.435	
		Hannan-Quinn criter.	7.907591	F-statistic	5.483456	
		Durbin-Watson stat	0.220280	Prob(F-statistic)	0.000000	
			Coefficient	Std. Error	t-Statistic	p
Stock Market Volatility (Model 1)		The prevalence of depressive disorders	**-5.339178**[***]	3.061034	-1.744240	0.0816
		R-squared	0.566741	Mean dependent var	21.95971	
	FMOLS	Adjusted R-squared	0.533364	S.D. dependent var	12.02448	
		S.E. of regression	8.214011	Sum squared resid	45542.23	
		Long-run variance	129.5761			
			Coefficient	Std. Error	t-Statistic	p
		The prevalence of depressive disorders	**-10.67944**[*]	3.357660	-3.180620	0.0016
		R-squared	0.676950	Mean dependent var	22.03028	
	DOLS	Adjusted R-squared	0.599892	S.D. dependent var	11.25119	
		S.E. of regression	7.116835	Sum squared resid	27603.89	
		Long-run variance	60.89509			

note: c: constant. p: probability. *: significant at 0.01 level. **: significant at 0.05 level.*** : significant at 0.1 level.
LS: Panel Effects Specification: Cross-section = none, Period = fixed.
FMOLS: trend specification: linear, cointegrating regressor specification-additional trends: none
DOLS: trend specification: linear, fixed leads and lags specification (lead=1, lag=1)

Tablo 7. Model 2 (Dependent = The Prevalence of Depressive Disorders - Independent Stock Price Volatility) Panel Regression Analysis Results

Dependent Variable	Method	Independent Variable	Coefficient	Std. Error	t-Statistic	p
		c	**4.093429***	0.065982	62.03896	0.0000
		Stock Price Volatility	**-0.005053****	0.002564	-1.971141	0.0491
		Root MSE	0.908406	R-squared	0.005140
		Mean dependent var	3.980949	Adjusted R-squared	0.003817
	LS	S.D. dependent var	0.911355	S.E. of regression	0.909614
		Akaike info criterion	2.651055	Sum squared resid	622.2024
		Schwarz criterion	2.663324	Log likelihood	-997.4478
		Hannan-Quinn criter.	2.655781	F-statistic	3.885398
		Durbin-Watson stat	0.005226	Prob(F-statistic)	0.049074
			Coefficient	**Std. Error**	**t-Statistic**	**p**
The Prevalence of Depressive Disorders (Model 2)		Stock Price Volatility	**-0.002378*****	0.001249	-1.903507	0.0574
		R-squared	0.975183	Mean dependent var	3.979872
	FMOLS	Adjusted R-squared	0.973271	S.D. dependent var	0.912542
		S.E. of regression	0.149192	Sum squared resid	15.02423
		Long-run variance	0.065868		
			Coefficient	**Std. Error**	**t-Statistic**	**p**
		Stock Price Volatility	**-0.001072**	0.001803	-0.594849	0.5522
		R-squared	0.979450	Mean dependent var	3.982001
	DOLS	Adjusted R-squared	0.974548	S.D. dependent var	0.916428
		S.E. of regression	0.146203	Sum squared resid	11.64953
		Long-run	0.043705		

note: c: constant. p: probability. *: significant at 0.01 level. **: significant at 0.05 level.*** : significant at 0.1 level.
LS: Panel Effects Specification: Cross-section = none, Period = none.
FMOLS: trend specification: linear, cointegrating regressor specification-additional trends: none
DOLS: trend specification: linear, fixed leads and lags specification (lead=1, lag=1)

Tablo 8. Model 3 **(**Dependent = The Prevalence of Depressive Disorders - Independent = Stock Market Return) Panel Regression Analysis Results

Dependent Variable	Method	Independent Variable	Coefficient	Std. Error	t-Statistic	p
		c	3.981741*	0.007751	513.7161	0.0000
		Stock Market Return	**-4.55E-05**	4.24E-05	-1.073858	0.2832
		Root MSE	0.207314		R-squared	0.948251
		Mean dependent var	3.980736		Adjusted R-squared	0.946398
	LS	S.D. dependent var	0.911942		S.E. of regression	0.211134
		Akaike info criterion	-0.237448		Sum squared resid	32.36337
		Schwarz criterion	-0.071645		Log likelihood	116.3991
		Hannan-Quinn criter.	-0.173572		F-statistic	511.6640
		Durbin-Watson stat	0.066382		Prob(F-statistic)	0.000000
			Coefficient	**Std. Error**	**t-Statistic**	**p**
The Prevalence of Depressive Disorders (Model 3)		Stock Market Return	**-0.000217***	6.02E-05	-3.602001	0.0003
		R-squared	0.976071		Mean dependent var	3.979658
	FMOLS	Adjusted R-squared	0.974225		S.D. dependent var	0.913152
		S.E. of regression	0.146604		Sum squared resid	14.48604
		Long-run variance	0.063380			
			Coefficient	**Std. Error**	**t-Statistic**	**p**
		Stock Market Return	**-0.000275***	8.18E-05	-3.366751	0.0008
		R-squared	0.978951		Mean dependent var	3.975792
	DOLS	Adjusted R-squared	0.975915		S.D. dependent var	0.915175
		S.E. of regression	0.142030		Sum squared resid	12.58760
		Long-run variance	0.048083			

note: c: constant. p: probability. *: significant at 0.01 level. **: significant at 0.05 level.*** : significant at 0.1 level.
LS: Panel Effects Specification: Cross-section = fixed, Period = none.
FMOLS: trend specification: linear, cointegrating regressor specification-additional trends: none
DOLS: trend specification: linear, lag&lead method=Akaike)

The results of the panel regression analysis for the models established according to the causality relationships that are found to be significant according to the Pairwise Dumitrescu Hurlin Panel Causality Tests are given in Table 6, 7 and 8. In Model 1, stock market volatility is chosen as a dependent and the prevalence of depressive disorders as an independent variable. The prevalence of depressive disorders is determined as a dependent variable both in Model 2 and 3. Independent variables of Model 2 and 3 are defined as stock market volatility and return respectively. First of all, LS (least squares)

method is done. Then, to avoid some deviations in the LS method, to correct internal bias, and to eliminate the correlation between explanatory variables and error terms, FMOLS (fully modified ordinary least squares) (Phillips & Hansen, 1990) and DOLS (dynamic ordinary least squares) (Stock & Watson, 1993) methods are applied on all three models.

When the analysis results of Model 1 in Table 6 are examined, it is understood that the model established for all three methods is significant (p_{LS} = 0.0103, p_{FMOLS} = 0.0816 and p_{DOLS} = 0.0016). In all methods applied for Model 1, it is concluded that stock market volatility is a function of the prevalence of depressive disorders and its coefficient is negative. The coefficients of the prevalence of depressive disorders are -1.230266 for the LS method, -5.339178 for the FMOLS model, and -10.67944 for the DOLS model, respectively.

The results of the analysis of Model 2 are seen in Table 7. While the results of the model number 2 established using the LS (p_{LS} = 0.0491) and FMOLS (p_{FMOLS} = 0. 0574)methods indicate the significance of the model, no significance is determined in the DOLS (p_{DOLS} = 0.5522)method. In addition, it is seen that the coefficients of the Stock Price Volatility variable for all methods belonging to Model 2 have negative signs. In this model, according to Table 6, the prevalence of depressive disorders appears to be negatively influenced by stock market. The stock price volatility coefficients for the LS technique, the FMOLS model, and the DOLS model are -0.005053, -0.002378, and -0.001072, respectively.

It is revealed from Table 8 that, while the results of FMOLS (p_{FMOLS} = 0.0003)and DOLS (p_{DOLS} = 0.0008) methods are found to be significant, the model is not significant according to the LS (p_{LS} = 0.2832) method. However, in the analysis results of all methods, it is understood that the coefficients of the stock market return variable have a negative sign. The third model shows that the stock market return has a negative impact on the prevalence of depressive disorders. The coefficients are -4.55E-05 for LS, -0.000217 for FMOLS and -0.000275 for DOLS.

Discussion and Conclusion

The first of the results reached in the study is that there is a negative bidirectional relationship structure between stock price volatility and the prevalence of depressive disorders. In other words, the increase or decrease in stock market volatility manifests itself in the opposite direction in the prevalence of depressive disorders. In addition, the increase or decrease in the prevalence of depressive disorders causes stock price volatility to move in the opposite direction. This result refutes the first and second null hypothesis H_10 and H_20 respectively. These results imply that the prevalence of depressive disorders may be the Granger cause of volatility in stock prices, and volatility in stock prices may be the Granger cause of prevalence of depressive disorders. While it is expected that the increase in stock price volatility will have a negative effect on the mental health of the investors, the opposite result of this expectation is reached in our study. In addition, the findings in the study that the increase in the prevalence of depressive disorders may cause a decrease in volatility in stock prices or that there is a link in the opposite direction are considered as expected results.

Another result is that stock market returns affect the prevalence of depressive disorders and this interaction has a negative sign. This result can be interpreted as the increase in the stock market return

will decrease the prevalence of depressive disorders or the decrease in the stock market return will increase the prevalence of depressive disorders. This result refutes the fourth null Hypothesis H_40. This finding strengthens the thesis that the stock market return may be the Granger cause of the prevalence of depressive disorders. This dynamic obtained seems to be compatible with the statement by Marazziti et al. in their study in 2021 that economic concerns have an impact on mental health. While the increase in market returns can be considered as an indicator of a positive economic situation and may create depressive tendencies, on the contrary, when the returns decrease, depressive effects can be expected to increase. The findings of Senarathne and Perera (2021) in their study, that depression and anxiety decrease as investors' returns increase in a balanced market, and that depression and anxiety increase when investors' returns are equal to or lower than the risk-free rate, support this finding of our study.

On the other hand, no causal relationship can be obtained that the prevalence of depressive disorders affects the stock market return. This finding accepts the third null Hypothesis H_30. In other words, this finding provides evidence that the prevalence of depressive disorders is not the Granger cause of stock market returns.

The fact that the data set used in the study has a limited time frame is considered among the limitations of the study. In addition, it is another point that should not be overlooked that the findings may vary according to the time intervals and the country sets examined.

It is thought that the findings obtained are important in terms of revealing the interrelationships of the movements in the returns and volatility of stock markets with the prevalence of depression, which is among mental disorders, and their potential to affect each other.

In future studies, it is recommended to investigate the existence and possible effects of connection situations between different mental disorders and financial market dynamics. Thus, the connections between the investigated variables will be revealed and scientifically valid results will be reached as a basis in order to make predictions about the changes that may occur in the future.

Ethics Committee Permission

This article is not part of a working group that requires ethical committee approval.

Contribution Rate Statement

The authors contributed equally to the article.

Conflict of Interest Statement

There is no conflict of interest between the authors.

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Kaynakça

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