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Research Article/Araştırma Makalesi

Causality Relationship Between Global Risk Indicators and BIST-Tourism Index

Küresel Risk Göstergeleri ile BİST-Turizm Endeksi Arasındaki Nedensellik İlişkisi

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Abstract

The aim of the study is to examine the causal relationship between the CBOE Volatility Index (VIX), oil price, dollar index, and BIST-Tourism index in the context of the Global Economic Policy Uncertainty (EPU) between February 1997 and September 2022. To achieve this aim, the Fourier Toda Yamamoto (TY) causality test and the fractional Fourier TY causality test were used. The Fourier TY causality test results show that there is a one-way causative relationship between the dollar index and the BIST-Tourism index, between the VIX index and the global EPU index, and between the dollar index and oil price. In addition, it is seen that there is a bidirectional causal relationship between the dollar index and the global EPU index. According to the results obtained from the fractional Fourier TY causality test, there is a bidirectional causal relationship between BIST-tourism and global EPU and between BIST-tourism and oil price. In addition, a one-way causality relationship was found from the VIX index to the BIST-Tourism index, from the dollar index to the BIST-Tourism index, from the global EPU to the VIX index, and from the oil price to the dollar index. These results show that the shocks are permanent. Overall, the findings suggest that the interaction between stock prices and both national and global macroeconomic indicators is mainly a consequence of financial globalization. In other words, the liberalization of fund transfers as a result of the liberalization of money and capital markets has led to the emergence of a multidirectional interaction between many variables.

Jel Codes: *E44, Q43, C50*
Keywords: *Global EPU Index, VIX, Fourier Toda-Yamamoto, BIST-Tourism*

Öz

Çalışmanın amacı, Şubat 1997-Eylül 2022 döneminde küresel EPU bağlamında VIX endeksi, petrol fiyatı, dolar endeksi ve BİST-Turizm endeksi arasındaki nedensel ilişkiyi incelemektir. Bu amaca ulaşmak için Fourier Toda Yamamoto (TY) nedensellik testi ve kesirli Fourier TY nedensellik testi kullanılmıştır. Fourier TY nedensellik testi sonuçlarına göre, dolar endeksinden BİST-Turizm endeksine, VIX endeksinden küresel EPU endeksine, petrol fiyatı ve dolar endeksinden VIX endeksine doğru tek yönlü nedensellik ilişkisi bulunmaktadır. Ayrıca dolar endeksi ve küresel EPU endeksi arasında çift yönlü nedensellik ilişkisinin olduğu görülmektedir. Kesirli Fourier TY nedensellik testinden elde edilen sonuçlara göre BIST-Turizm ve küresel EPU ile BIST-Turizm ve petrol fiyatı arasında çift yönlü nedensellik ilişkisi vardır. İlave olarak VIX endeksinden BIST-Turizm endeksine, dolar endeksinden BIST-Turizm endeksine, küresel EPU'dan VIX endeksine ve petrol fiyatından dolar endeksine doğru tek yönlü nedensellik ilişkisi saptanmıştır. Elde edilen bu sonuçlar şokların kalıcı olduğunu göstermektedir. Genel olarak, bulgular, hisse senedi fiyatları ile hem ulusal hem de küresel makroekonomik göstergeler arasındaki etkileşimin esas olarak finansal küreselleşmenin bir sonucu olduğunu göstermektedir. Diğer bir deyişle, para ve sermaye piyasalarının serbestleşmesi sonucunda fon transferlerinin serbestleşmesi, birçok değişken arasında çok yönlü bir etkileşimin ortaya çıkmasına neden olmuştur.

Jel Kodları: *E44, Q43, C50*
Anahtar Kelimeler: *Küresel EPU Endeksi, VIX, Fourier Toda-Yamamoto, BİST-Turizm*

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1. Introduction

The interactions between the actual economy of all nations have grown along with the expansion of global trade liberalization. The international integration trend, whether big or small, has affected the economic and financial performance of other countries (Tsai, 2017). In other words, changes in the world's economies, conditions of the economy, wars, internal problems, supply and demand, environmental disasters, political uncertainty, and conflicts all have an impact on the global markets. Especially high-risk markets are more sensitive to these developments (Hatipoglu & Tekin, 2017). A substantial collection of theoretical and empirical work has recently been published that looks at how stock markets react to various risk variables (Kang & Ratti, 2013; Arouri et al., 2016; Yuan et al., 2022).

Risks that cannot be measured serve as an expression of uncertainty (Arunajatesan & Viswanathan, 2008). Nonetheless, the recent advancement of new techniques for measuring uncertainty suggests that, in time, there will be new theoretical advancements for the literature on finance. The new risk and uncertainty calculation methods that have been used recently are based on the frequency of particular keywords or the volume of articles on particular subjects published in the nation's newspapers. These numbers can demonstrate some economic developments and trends in the concerned nation. One of these indices, the Global Economic Policy Uncertainty Index (GEPU), was calculated using the method developed by Baker et al. (2016) (Akdag & Iskenderoglu, 2021). Recently, many studies have examined both the specific and general effects of EPU (Tsai, 2017).

When some EPU studies are examined in the literature, many variables associated with EPU can be found. These are tourism (Gozgor & Demir, 2018; Singh et al., 2019; Payne & Apergis, 2020); stock market (Korkmaz & Gungor, 2018; Akdag & Iskenderoglu, 2021; Aslan & Altinöz, 2019; Wu, Liu & Hsueh, 2016; Gursoy & Zeren, 2022); exchange rate (Krol, 2014; Juhro & Phan, 2018); oil (Gulcan, 2022) (For detailed literature, see Table 1).

As a result, the current study's objective is to investigate the correlation between various global risk indicators, including the price of oil, the VIX index, the dollar index, and the BIST-Tourism index, within the framework of the global EPU. The tourist industry is impacted both favorably and unfavorably by potential changes in global risk variables as the global EPU, oil price, VIX index, and dollar index. For instance, changes in the dollar exchange rate may be caused by both political and economic factors on a worldwide scale. With this modification, travelers who favor Turkiye as a vacation destination will have another option that is less expensive. Also, a rise in interest rates has a detrimental impact on the tourism industry, as well as many other industries, because it raises the cost of borrowing money. Costs will reduce due to a possible drop in oil prices brought on by developments around the world (Demirkale & Can, 2021). This study investigated the relationship between the BIST-Tourism Index and changes in global risk variables. This link was investigated using Fourier TY and fractional Fourier TY causality studies, and the results were evaluated.

In this context, the second part of the study includes the literature on the studies examining the relationship between the variables in question, the data set in the third part, the method in the fourth part and the empirical findings in the fifth part. Then the conclusion and evaluation follow.

2. Conceptual Framework

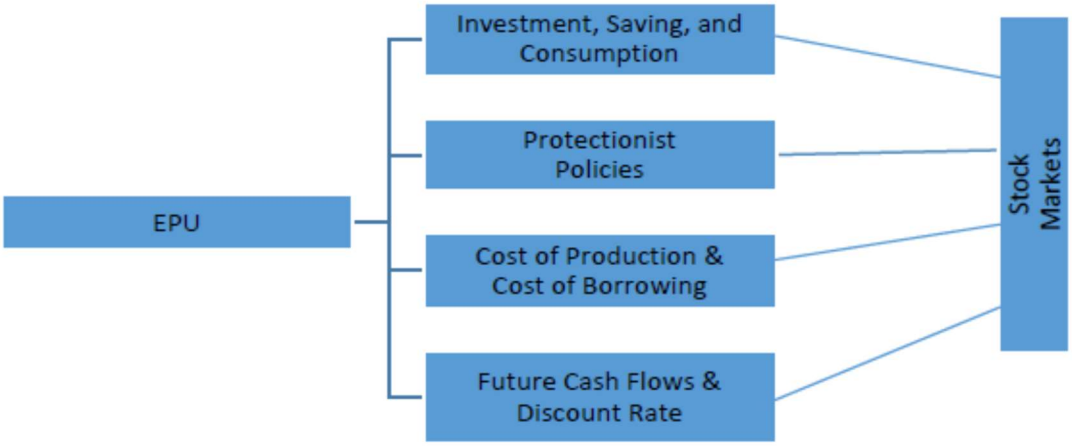
Both economic and political risk factors affect the markets and can change the direction of investors' decisions. Especially in developing countries, economic and political developments that may occur on local and global platforms negatively affect the stock market indices of the country. This negative effect not only affects the stock market but also negatively affects other macroeconomic and financial indicators. In addition to the increasing impact of globalization, developments in information technologies also increase the magnitude of this impact (Demirkale & Can, 2021).

The majority of decisions people make in reality are made in an unclear environment (Liu, 2010). Financial institutions and market players closely monitor economic risks since they have an impact on all facets of society. In an environment of uncertainty, investors may postpone or cancel their investment decisions entirely. Trade on a national and international level is impacted by this circumstance (Akdag, Yildirim & Alola, 2021). Hence, as financial flows and trade increase and the global economy becomes more linked, this uncertainty may extend over national boundaries and affect other economies (Trung, 2019). Researchers and policymakers have taken a renewed interest in studying how uncertainty affects macroeconomic conditions across borders, particularly during the 2008 global financial crisis (Luo & Zhang, 2020).

The EPU can have an impact on asset prices through a variety of methods. First, EPU has the power to alter or postpone crucial decisions made by businesses and other economic players, including those related to employment, investment, consumption, and saving (Gulen & Ion, 2013). Second, both supply and demand channels may be impacted by the EPU, which would result in lower investment and higher financing and production costs. Finally, EPU might make financial markets riskier. In addition, EPU may have an impact on predicted risk premiums, interest rates, and inflation (Pastor & Veronesi, 2012; Arouri et al., 2016).

There are numerous potential connections connecting the stock market and the EPU index among these. The impact of the stock market on the investment channel is one of them. For instance, if the EPU increases, investors will want to sell equities that are particularly high-risk, which will decrease demand for the stock. More stock price fluctuations and volatility are brought on by this fall (see Figure 1) (Syed & Bouri, 2022). Because uncertainty fuels economic unrest, which raises the risk associated with stock market investments. Stock market volatility is also brought on by the erratic flow of international mutual funds of companies listed on stock exchanges due to uncertainty. Hence, for stock market investors to reduce investment risk, it is crucial to understand whether a large economy is experiencing stable growth (Tsai, 2017).

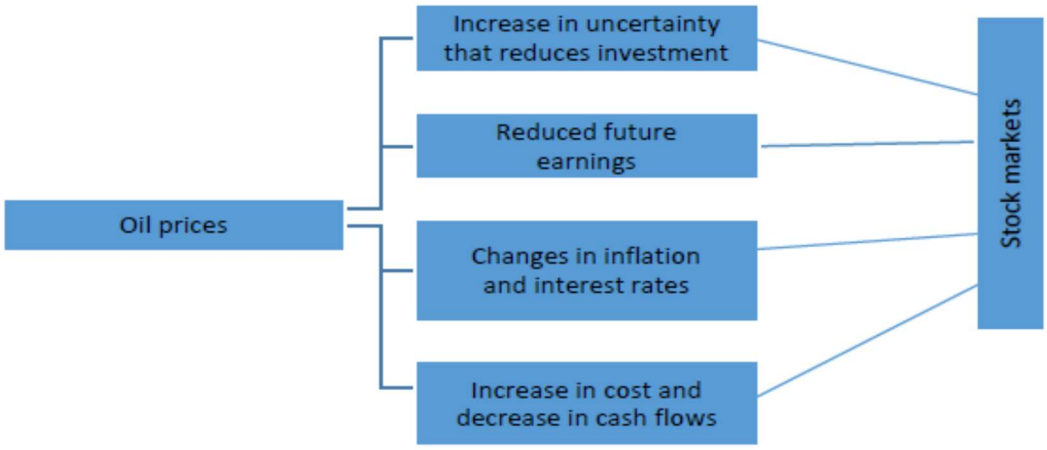
Figure 1: Potential Connections Between the Stock Market and the EPU



Source: (Syed & Bouri, 2022).

Oil price shocks are anticipated to have considerable repercussions on the actual economy in both oil-importing and -exporting nations in addition to the EPU. Together with the effects of oil price shocks on macroeconomic indicators like production and inflation, the effect of oil on stock prices is also explored (Pan, Wang & Liu, 2016). Changes in the price of oil can have a variety of effects on stock market results. First, investors choose to wait and see rather than invest due to the ambiguity around oil prices. Second, a rise in oil prices may result in lower net earnings in the future, which will lower stock prices. Third, rising oil costs increase nominal interest rates and inflation. Fourth, the increase in oil prices is likely to increase production costs, which may result in a fall in firm margins and cash flows, which will ultimately have an impact on the stock (Syed & Bouri, 2022). Figure 2 presents information on the putative relationship between oil prices and stock market indexes.

Figure 2: Potential Connections Between the Stock Market and Oil Prices



Source: (Syed & Bouri, 2022).

As shown in Figure 2, changes in oil prices and the unpredictability of economic policy have an impact on stock values by altering anticipated cash flows and/or discount rates. Given how significant oil price shocks are for the economy, it is crucial that policymakers react effectively (Kang & Ratti, 2013).

3. Literature Review

Many research have been conducted in Turkiye and other countries to ascertain the relationship between factors like the VIX index, oil price, dollar index, and other variables like the stock market and stock returns in the context of the global EPU. Several techniques and variables were employed in these research in an effort to provide relevant results, and it was also attempted to establish a relationship between the variables. Table 1 in this context provides details on both home and foreign literature.

Table 1: Literature Review

Author(s)	Time/ Country	Methods	Variables	Results
Guler et al. (2010)	2000 - 2009	Cointegration and causality testing	-Oil prices -Stock prices	Between the factors, a long-term link was discovered.
Kang & Ratti (2013)	1985:1–2011:12 USA	Structural VAR	-Crude oil -EPU -Stock returns	Real stock returns are negatively impacted by a rise in policy uncertainty.
Jouini (2013)	7 June 2005-21 October 2008 Gulf Cooperation Countries	Panel cointegration	-MSCI World index -US interest rate -Stock market index -Brent oil	There is a significant cointegration relationship between the variables.
Li, Zhang & Gao (2015)	4 January 1985- 31 October 2014 USA	GARCH ADCC	-EPU -S&P 500 -US 10-year bond	EPU shocks negatively affect stocks.
Wu, Liu & Hsueh (2016)	2003:01-2014:12 9 countries	Bootstrap panel causality test	-EPU -Stock market index	EPU was discovered to have a causal association with UK stock market indexes.
Arouri et al. (2016)	1900–2014 USA	Markov-switching	-EPU -S&P500	Stock gains are considerably reduced as policy uncertainty rises.
Hatipoglu & Tekin (2017)	- Turkiye	Quantile regression	-Oil prices -US Dollar -VIX index -BIST100 index	The most influential factor on the BIST index is the VIX index. In addition, it has been observed that oil prices do not affect the BIST index asymmetrically.
Christou et al. (2017)	January 1998-December 2014/ six countries	Panel vector autoregressive model	-Stock Returns -EPU	The US EPU negatively impacts stock returns in all countries except Australia.
Akçalı, Mollaahmetoglu & Altay (2019)	30.09.2009-05.07.2018/ Turkiye	DCC-GARCH	-BİST-100 -EMBI -Dow Jones -Exchange -US Dollar Index -VIX index -Brent oil	Crude petroleum and EMBI fluctuation reduce the volatility of the BIST-100 index whereas other variables' volatility raises it.
Aslan & Altinöz (2019)	1997-2017/ Turkiye	ARDL	-BIST Tourism -EPU	There is a unidirectional causality from EPU to BIST Tourism Index.
Dong & Min-Yoon (2019)	January 1995-June 2017/ Asian countries	Time-varying parameter (TVP) models	-USA EPU -US monetary policy uncertainty index -MSCI world index -VIX index -Other variables	In contrast to other variables, the MSCI world index and the US exchange rate indicate a stronger association with emerging Asian stock markets.
Matkovskyy, Jalan &	27/04/2015 - 25/10/2018	BVAR	-EPU -Bitcoin	It has been determined that using bitcoin as a hedging mechanism

Dowling (2020)			-NASDAQ100, -S&P500, -Other variables	against shocks in economic uncertainty is preferable.
Akdag & Yildirim (2021)	02/1988 – 05/2019/ European countries	Johansen cointegration test, FMOLS and DOLS	-EPU -BİST100 ındex	There is a long-term relationship between EPU and BIST 100 index. In addition, it is seen that the increases in the EPU negatively affect the BIST 100 index.
Akdag & Iskenderoglu (2021)	2006- 2018	Cointegration test, FMOLS and DOLS	-STOXX Global 1800 -EPU -VIX index -Other variables	The VIX and EPU indices negatively affect the tourism index.
Syed & Bouri (2022)	January 2000– December 2019	GARCH	-GEPU index -Crude oil prices -Stock prices	GEPU and the volatility of the oil price have a greater impact on the stock market volatility of emerging nations.
Camgoz (2022)	October 2011 – September 2021	NARDL	-GEPU -GPR (Geopolitical risk) -Oil Volatility Index -VIX index -BİST100	All stock prices and factors affecting global uncertainty were found to have an extended asymmetric cointegration relationship.

In the reviewed literature, there are studies (Kang & Ratti, 2013; Li, Zhang & Gao, 2015; Wu, Liu & Hsueh, 2016; Arauri et al., 2016; Christou et al., 2017; Aslan & Altinöz, 2019; Dong & Min-Yoon, 2019; Akdag & Yildirim, 2021; Akdag & Iskenderoglu, 2021; Camgoz, 2022) evaluating the relationship between the EPU and the stock market, which is the main subject of the current study. From these studies Kang & Ratti (2013); Li, Zhang & Gao (2015); Arauri et al. (2016); Christou et al. (2017); Akdag & Yildirim (2021); Akdag & Iskenderoglu (2021) determined that the increase in the EPU index affected the stock market or stock returns negatively. Some studies (Guler et al., 2010; Jouini, 2013; Wu, Liu & Hsueh, 2016; Aslan & Altinöz, 2019; Syed & Bouri, 2022; Camgoz, 2022) have determined whether or not there is a relationship between EPU and stock market index/stock returns or the direction of the relationship.

4. Data Set

This research examines the correlation between a few global risk indicators and BIST-Tourism from 2003:M01 to 2022:M09. Fourier TY and fractional Fourier TY causality analyses were used to investigate this connection. Table 2 contains the variable and source details for this analysis.

Table 2: Description of Data

Variables	Description	Source
BIST-T	BIST-Tourism Index	investing.com
GEPU	Global Economic Political Uncertainty Index	policyuncertainty.com
VIX	Volatility Index	investing.com
BRENT	Brent Oil	investing.com
DOLLAR	Dollar Index	investing.com

Table 2 lists the variables used in the study along with their sources. The different variables were changed using logarithms. The variables in the study are described in detail in Table 3.

Table 3: Descriptive Statistics

	BIST-T	GEPU	VIX	BRENT	DOLLAR
Mean	1.7615	2.0757	1.2897	1.7059	1.9616
Median	1.7698	2.0534	1.2855	1.7678	1.9687
Max.	2.7671	2.6337	1.7773	2.1456	2.0800
Min.	0.8920	1.6890	0.9781	1.0195	1.8561
Std. Dev.	0.3562	0.2092	0.1531	0.2699	0.0513
Skewn.	0.3726	0.3915	0.3840	-0.5501	0.0994
Kurtosis	3.6972	2.3587	2.8324	2.3635	2.3902
Jarque-Bera	13.3667	13.149	7.9320	20.7361	5.2786
Prob.	0.0012	0.0013	0.0189	0.0000	0.0714
Sum	542.5585	639.3211	397.2400	525.4254	604.1925
Sum Sq. Dev.	38.9608	13.4472	7.2021	22.3666	0.8094
Observations	308	308	308	308	308

5. Method

Granger's (1969) causality approach is the one that is typically employed for investigating the causal link between the variables. With this approach, which is based on the VAR model, the analysis is done by picking the first difference if the series are not stationary. However, if the difference between the two series is taken, it can result in a long-term loss of knowledge. The Granger causality approach, established by Toda-Yamamoto in 1995, was created to address this problematic circumstance. Traditional causality techniques like the Granger (1969) and Toda-Yamamoto (1995) tests disregard structural changes. Thus, in analysis of series including structural breakdowns, causality tests may produce biased results.

The Fourier Granger causality test was proposed by Nazlioglu et al. (2016) and Enders & Jones (2016) for short-term samples with structural changes. A causality test for time series analysis was created by Enders & Jones (2016) using the Fourier methodology and the Granger causality method, and by Nazlioglu, Gormus & Soytas (2016) using the Toda-Yamamoto causality method. This approach also accounts for structural changes.

Historically, dummy variables with abrupt shifts have been employed to model structural breaks. The smooth transition technique is also used to control structural fractures since structural changes can be gradual. Both strategies require knowledge about the quantity, types, and dates of breaks. By including a Fourier function into the vector autoregressive

model (VAR) to account for the potential for numerous uniform changes, Enders & Jones (2016) developed a new method for causality tests to solve these difficulties (Nazlioglu et al., 2016). It is common knowledge that stationary variables should be employed in the VAR framework to prove causality. In other words, it is necessary to compute their difference in order to use non-stationary variables in the VAR model. On the other hand, accounting for the variations leads to information loss over time. Nazlioglu et al. (2016) use the Fourier TY causality test in their work, which was made by combining the TY causality test with Fourier functions. Furthermore, Nazlioglu et al. (2016) tests can be used with both short-term samples and structural modifications.

In order to take into account structural breaks in the Fourier TY causality analysis, which was brought to the literature by Nazlioglu et al. (2016), the assumption that the constant term α does not change over time is expanded. Thus, the VAR (p+d) model is formulated as follows.

$$y_t = \alpha(t) + \beta_1 y_{t-1} + \cdots + \beta_{p+d} y_{t-(p+d)} + \varepsilon_t \quad (1)$$

$\alpha(t)$ in equation (1) is a function of time, and yt refers to the structural changes that occur. When the structural break date, number and form of the series are unknown, the Fourier equation to be estimated to detect the gradual structural changes is as in equation (2):

$$\alpha(t) = \alpha_0 + y_1 \sin\left(\frac{2\pi k}{T}\right) + y_2 \cos\left(\frac{2\pi kt}{T}\right) \quad (2)$$

where k denotes the approximation frequency. By putting Equation (2) in Equation 1, Equation 3 is obtained.

$$y_t = \alpha_0 + y_1 \sin\left(\frac{2\pi k}{T}\right) + y_2 \cos\left(\frac{2\pi kt}{T}\right) + \beta_1 y_{t-1} + \cdots + \beta_{p+d} y_{t-(p+d)} + \epsilon_1 \quad (3)$$

The standard VAR model is employed in this formulation to test the Granger null hypothesis of non-causality. The F statistic is suggested by Lütkepohl (2005) as an alternative to the Wald test. Critical value bootstrapping has been used in recent studies in the Granger causality field to improve the power of the test statistic in small samples while retaining robustness to the unit root and cointegration qualities of the data. The bootstrapping method is used to obtain the F-statistics bootstrap distribution.

6. Empirical Findings

Before using the Fourier TY causality test, it is first ascertained whether the series is stationary. The stationarities were tested with the Augmented Dickey Fuller (ADF), Phillips and Perron (PP) and Fourier ADF tests[2].

[2] In the present study, the Fourier ADF unit root test was applied. However, trigonometric terms were not reported because they were not significant. In cases where trigonometric terms are meaningless, it is more appropriate to use traditional unit root tests, as suggested by Enders & Lee (2012).

Table 4: Results of Unit Root Tests for ADF and PP

		ADF				PP				
		Level		First differences		Level		First differences		
		Test ist.	Prob	Test ist.	Prob	Test ist.	Prob	Test ist.	Prob	
Constant	BIST-T	-0.9968	0.7552	-5.1053	0.0000	-1.110	0.7125	-16.076	0.0000	I(1)
	GEPU	-1.8927	0.3356	-13.514	0.0000	-2.472	0.1234	-28.169	0.0000	I(1)
	VIX	-4.4517	0.0003	-10.150	0.0000	-5.052	0.0000	-29.494	0.0000	I(0)
	BRENT	-1.9530	0.3078	-12.055	0.0000	-1.850	0.3559	-14.522	0.0000	I(1)
	DOLLAR	-1.2171	0.6679	-6.606	0.0000	-1.381	0.5917	-16.878	0.0000	I(1)
Constant and trend	BIST-T	-2.8090	0.1952	-5.227	0.0000	-2.570	0.2942	-16.065	0.0000	I(1)
	GEPU	-3.6434	0.0279	-8.677	0.0000	-5.158	0.0001	-28.278	0.0000	I(0)
	VIX	-4.5025	0.0017	-10.150	0.0000	-5.160	0.0001	-29.743	0.0000	I(0)
	BRENT	-2.2773	0.4446	-12.047	0.0000	-2.118	0.5329	-14.503	0.0000	I(1)
	DOLLAR	-1.0145	0.9393	-6.6899	0.0000	-1.185	0.9110	-16.909	0.0000	I(1)

The VIX variable is stationary at the level (I(0)) in the fixed model, per the findings of the ADF and PP unit root tests, but the other variables are stationary at the difference, i.e. I(1). In contrast, the GEPU and VIX variables are stationary at level in the fixed and trend model, whereas other variables are stationary at difference.

With the aid of information criteria, the step of identifying the lag levels is initiated when the stationarity levels of the variables are established. Table 5 presents the findings in this regard.

Table 5: Appropriate Delay Length Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	790.2449	NA	3.67e-09	-5.2349	-5.1732	-5.2102
1	2580.171	3508.254	2.85e-14	-17.0011	**-16.6307***	**-16.8529***
2	2620.752	78.1862	2.57e-14*	-17.1050*	-16.4259	-16.8332
3	2644.657	45.2598*	2.58e-14	-17.0977	-16.1100	-16.7024
4	2661.766	31.8229	2.73e-14	-17.0451	-15.7487	-16.5263
5	2675.220	24.5770	2.95e-14	-16.9681	-15.3631	-16.3258
6	2686.978	21.0861	3.22e-14	-16.8798	-14.9662	-16.1140
7	2704.022	29.9976	3.41e-14	-16.8268	-14.6045	-15.9374
8	2718.666	25.2845	3.66e-14	-16.7577	-14.2268	-15.7449

Table 5 shows the appropriate lag lengths determined by the information criteria. The appropriate delay length according to SC and HQ is the first delay. After this stage, the Fourier TY causality test can be performed. Fourier TY causality and fractional Fourier TY causality tests were performed to test whether the shocks were transient or permanent. Fourier TY causality test results are given in Table 6.

Table 6: Results of Fourier TY Causality Analysis

	Test stats.	Boostrap prob.	Appropriate delay (p)	Appropriate Frequency (k)
GEPU=>BIST-T	2.4248	0.4972	3	1
VIX=>BIST-T	3.0102	0.3849	3	1
BRENT=>BIST-T	5.5635	0.1391	3	1
DOLLAR=>BIST-T	19.7592*	0.0005	3	1
BIST-T=>GEPU	4.1522	0.2421	3	1
VIX=>GEPU	6.2976***	0.0995	3	1
BRENT=>GEPU	4.6176	0.2039	3	1
DOLLAR=>GEPU	15.4593*	0.0019	3	1
BIST-T=>VIX	3.9081	0.2729	3	1
GEPU=>VIX	2.8507	0.4120	3	1
BRENT=>VIX	44.8381*	0.0000	3	1
DOLLAR=>VIX	9.5725**	0.0252	3	1
BIST-T=>BRENT	2.4963	0.4712	3	1
GEPU=>BRENT	0.3706	0.9444	3	1
VIX=>BRENT	3.8246	0.2868	3	1
DOLLAR=>BRENT	1.2036	0.7543	3	1
BIST-T=>DOLLAR	5.3386	0.1576	3	1
GEPU=>DOLLAR	14.3646*	0.0032	3	1
VIX=>DOLLAR	0.8998	0.8207	3	1
BRENT=>DOLLAR	3.4128	0.3270	3	1

Note: *, ** and *** denotes 1, 5, and 10 percent level of statistical significance, respectively

According to the results in Table 6, there is a one-way causal relationship from the DOLLAR variable to the BIST-T variable, from the VIX variable to the GEPU variable, and from the BRENT and DOLLAR variables to the VIX variable. In addition, it can be observed that the DOLLAR and GEPU variables have a causal link that runs in both directions. For the other variables, a causal relationship could not be determined.

In addition, a fractional Fourier TY causality test was also performed to test whether the shocks are permanent. The results regarding this are shown in Table 7.

Table 7: Fractional Fourier TY Causality Test Results

	Test Stats.	Boostrap Prob.	Appropriate Delay (p)	Appropriate Frequency (k)
GEPU=>BIST-T	167.3918*	0.0000	3	0.70
VIX=>BIST-T	122.6568*	0.0000	3	0.70
BRENT=>BIST-T	50.7638*	0.0000	3	0.70
DOLLAR=>BIST-T	83.6564*	0.0000	3	0.70
BIST-T=>GEPU	11.7972**	0.0225	3	0.70
VIX=>GEPU	0.5173	0.8968	3	0.70
BRENT=>GEPU	4.0498	0.2326	3	0.70
DOLLAR=>GEPU	0.8316	0.8110	3	0.70
BIST-T=>VIX	5.4619	0.1380	3	0.70
GEPU=>VIX	11.4962**	0.0221	3	0.70
BRENT=>VIX	1.7932	0.5858	3	0.70
DOLLAR=>VIX	0.9508	0.7895	3	0.70
BIST-T=>BRENT	6.5682***	0.0913	3	0.70
GEPU=>BRENT	17.9426**	0.0108	3	0.70
VIX=>BRENT	4.7342	0.1956	3	0.70
DOLLAR=>BRENT	3.6732	0.2948	3	0.70
BIST-T=>DOLLAR	3.4217	0.2907	3	0.70
GEPU=>DOLLAR	5.0139	0.1465	3	0.70
VIX=>DOLLAR	6.4429	0.1071	3	0.70
BRENT=>DOLLAR	12.054**	0.0211	3	0.70

Note: *, ** and *** denotes 1, 5, and 10 percent level of statistical significance, respectively

Table 7's fractional Fourier TY causality test findings show that there is a bidirectional causal relationship between BIST-T and both GEPU and BRENT. A one-way causation link was also discovered between VIX and BIST-T, DOLLAR and BIST-T, GEPU and VIX, and BRENT and DOLAR. These findings demonstrate that the shocks are long-lasting.

From a theoretical point of view, there are many studies that point to the existence of a relationship between stock market indices and the variables used in the study. In particular, the focus was on studies examining the relationship between the global EPU and stock market indices, which is the main subject of the study. Wu, Liu & Hsueh (2016) found a causal relationship between EPU and stock market indices in their study. Aslan & Altinöz (2019) found a one-way causality relationship from the EPU to the BIST Tourism Index. Syed & Bouri (2021) found that stock market volatility is more sensitive to global factors such as GEPU and oil price volatility. In addition, Kiraci (2019) found a one-way causality relationship from the BIST Tourism Index to the dollar rate and oil prices. In addition, a one-way causality relationship has been determined from the dollar index to the BIST Tourism Index. These results corroborate the findings of the present study.

When the findings are evaluated in general, the interaction between stock prices and both national and global macroeconomic indicators can be seen mainly as a result of financial globalization. In other words, the liberalization of fund transfers as a result of the liberalization of money and capital markets has led to the emergence of a multi-faceted interaction between many variables.

7. Conclusion

Disorders in the financial and economic systems of one country have a considerable impact on, either directly or indirectly, other countries throughout the world. The performance of the financial markets in other nations is significantly impacted by changes in the global EPU and oil prices. Because a gloomy outlook on market behavior is frequently caused by uncertainties in economic policy. Also, changes in the price of crude oil have an impact on the general health of the nation's economy and consequently the financial markets because it is a crucial production input that significantly contributes to the growth and development of many countries. The current study's goal is to investigate the causal connections between the VIX index, oil price, dollar index, and BIST-Tourism index in the context of the global EPU during the time period of February 1997 to September 2022. This association was investigated using the fractional Fourier TY causality test and the Fourier TY causality test. The findings of the Fourier TY causality test indicate a one-way causal relationship between the dollar index and the BIST-Tourism index, the VIX index and the global EPU index, and the dollar index and the price of oil. It is also clear that there is a bidirectional causal relationship between the dollar index and the global EPU index. The findings of the fractional Fourier TY causality test indicate that there is a bidirectional causal relationship between BIST-tourism and both the global EPU and the price of oil. Also, it was discovered that there was a one-way causal relationship between the VIX index and the BIST-Tourism index, the dollar index and the BIST-Tourism index, the global EPU and the VIX index, and the oil price and the dollar index. These results show that the shocks are permanent. The results obtained in the current study are similar to those of other studies (such as Aslan & Altinöz (2019), Syed & Bouri (2022)) that found a relationship between the EPU and the stock market.

The empirical findings of this investigation can be used to infer various economic policy implications. The state of the world's financial markets affects each nation's financial markets. Turkiye is more impacted by happenings on the world stage since it has a shaky economy and imports oil. As a result, officials ought to put in the required effort to create an independent economic system.

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