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The Relationship of Geopolitical Risk and Tourism in Turkey: Fourier Toda-Yamamoto Causes Analysis

Türkiye'de Jeopolitik Risk ve Turizm İlişkisi: Fourier Toda-Yamamoto Nedensellik Analizi

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Abstract

The tourism sector is of vital importance for developing countries. Therefore, it is important to investigate the risk factors that may affect the tourism sector. It is a necessity to investigate the relationship between geopolitical risk and tourism, especially in Turkey, which is at the center of geopolitical tensions. The aim of the study is to examine the relationship between geopolitical risk and tourism in Turkey. In this study, the relationship between the number of tourists and geopolitical risk, Brent oil, the real effective exchange rate, and inflation in the 2003:02-2021:01 period was examined by Fourier Toda-Yamamoto (TY) and fractional Fourier TY causality tests. According to the results, a causal relationship between GPR and TOUR could not be determined. However, according to the results of the Fourier TY causality test, while a bidirectional causality relationship was detected between TOUR and BRENT, a unidirectional causality relationship was found from CPI to TOUR and from REER to CPI. In addition, according to the results of the Fractional Fourier TY causality test performed to test whether the shocks are permanent, a bidirectional causal relationship was determined between TOUR and BRENT and between TOUR and CPI.

Keywords:

Geopolitical risk, tourism, fourier TY causality analysis, Türkiye

Türkiye'de Jeopolitik Risk ve Turizm İlişkisi: Fourier Toda-Yamamoto Nedensellik Analizi

Öz

Turizm sektörü gelişmekte olan ülkeler için hayati öneme sahiptir. Dolayısıyla turizm sektörünü etkileyebilecek risk faktörlerinin araştırılması önemlidir. Özellikle jeopolitik gerilimlerin merkezinde yer alan Türkiye'de, jeopolitik risk ve turizm ilişkisinin araştırılması bir gerekliliktir. Bu bağlamda çalışmanın amacı, Türkiye'de jeopolitik risk ve turizm arasındaki ilişkiyi incelemektir. Bu çalışmada 2003:02-2021:01 döneminde turist sayısı ile jeopolitik risk, brent petrol, reel efektif döviz kuru ve enflasyon arasındaki ilişki Fourier Toda-Yamamoto (TY) ve Kesirli Fourier TY nedensellik testi ile incelenmiştir. Bulgulara göre, GPR ile TOUR arasında nedensellik ilişkisi tespit edilememiştir. Ancak Fourier TY nedensellik testi sonucuna göre, TOUR ile BRENT arasında çift yönlü nedensellik ilişkisi tespit edilirken, CPI'dan TOUR'a doğru ve REER'den CPI'ya doğru tek yönlü nedensellik ilişkisi bulunmuştur. Ayrıca şokların kalıcı olup olmadığını test etmek için yapılan Kesirli Fourier TY nedensellik testi sonucuna göre ise, TOUR ile BRENT ve TOUR ile CPI arasında çift yönlü nedensellik ilişkisi tespit edilmiştir.

Anahtar Kelimeler:

Jeopolitik risk, turizm, fourier TY nedensellik analizi, Türkiye.

Introduction

Tourism is an important sector in the economic development of developing countries (Demir, Simonyan, Chen & Lau, 2020). This sector attracts more and more attention all over the world due to its direct and indirect economic effects. Tourism generates foreign exchange income, contributes to employment, increases industry income and positively affects the gross domestic product (GDP) of nations (Lee & Chang, 2008). In this context, considering the importance of the tourism sector for the economy, it is of great importance to understand the risk factors that may affect the sector. One of these factors is geopolitical risk (GPR) and uncertainty (Hailemariam & Ivanovski, 2021). Geopolitical risk is described as "the risk connected with wars, acts of terrorism, and conflicts between nations that undermine the regular and peaceful flow of international relations" by Caldara & Iacoviello (2018). Travelers delay or postpone their plans due to concerns about their personal safety when geopolitical risks (GPRs) rise in a nation. Tourists are hesitant to travel to countries where GPRs are rising. As a result, a country's ability to thrive economically is constrained by the decline in tourism-related numbers and income (Demir et al., 2020).

Events like geopolitical conflicts, tensions, and even elections cause political turbulence or uncertainty and can significantly affect tourism arrivals, tourism imports, overnight stays, and other tourism development indicators (Akdiri, Eluwole, Akadiri, & Avcı, 2019). According to Balli, Uddin, and Shahzad (2019), the risks connected with wars, terrorism, tensions, ethnic and political violence, and wars inside and between states—all of which are referred to as "geopolitical risks"—greatly impact the socio-economic environment. Tensions claim that the dangers of racial and political violence frequently result in issues like decreased tourism to impacted places. According to Hall and O'Sullivan (1996), visitors' travel habits might be affected by the existence or danger of violent protests, social instability, civil war, terrorist actions, and human rights violations. because the tourism industry is very sensitive and prone to panic. This is why occurrences like wars, terrorism, tensions, and ethnic or political violence can influence both investors and tourists' behavior (Chiang Lee, Olasehinde-Williams & Akadiri, 2020).

The geography where Turkey is located draws attention in terms of geopolitical risk. As a country that synthesizes eastern and western cultures, Turkey has hosted different cultures throughout history. This situation has brought many problems, both economically and politically. The effects of the Arab Spring, which started especially in the Middle East, were deeply felt in Turkey as well. Because, together with the Arab Spring, terrorist incidents, wars and internal turmoil in the geography of Turkey have significantly affected the geopolitical risk level of the country in question. The developments in this process have shown that the risk factors around Turkey have changed the economic and political structure of the country (Gülcan & Ceyhan, 2022). This situation also disrupts the tourism sector, which makes a great contribution to the economy of a developing country like Turkey. Tourism-related income inflows play a

significant role in economic growth, particularly in developing nations. Through a number of transmission mechanisms, such as tourist inflows into the host nation, the enticement of foreign investments, the generation of foreign exchange, and the creation of tax-related income and employment possibilities, it mobilizes foreign capital (Alam & Paramati, 2016; Tiwari, Das, & Dutta, 2019). In this context, an increase in the GPR level may delay the decision-making process of market participants and negatively affect both demand and supply channels (Yang, Zhang, Yi & Peng, 2021). Therefore, policyholders should understand the impact of local and global uncertainties on tourism (Zhang, Jiang, Gao & Yang, 2022).

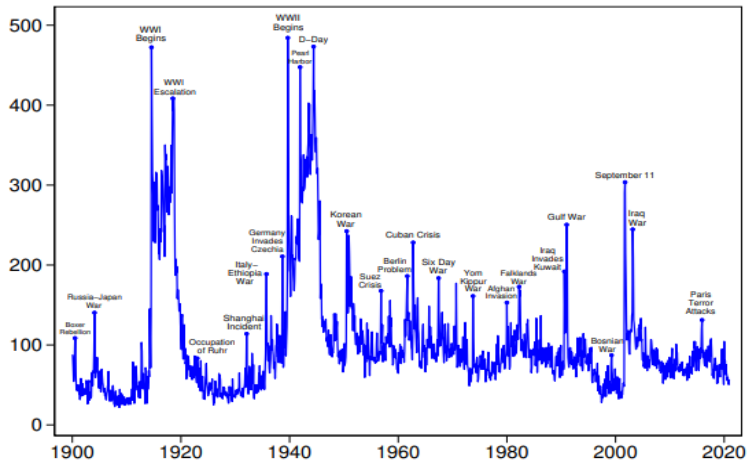
Considering that the era of geopolitical risks started with the September 11 terrorist attack, many countries in the world have been more or less affected by the events that took place after this date (Neacşu et al., 2018). In this context, some events that directly or indirectly concern Turkey are as follows: The oil embargo from Iraq (2002), the US invasion of Turkey's border neighbor Iraq (2003), the Danish Cartoon Crisis (2005), Iraq's the death penalty of former President Saddam Hussein (2006), the cross-border operation in Iraq (Güneş Operation -2008), Iran Nuclear Weapons Studies (2009), Arab Spring (2010-present), Mavi Marmara Attack (2010), The beginning of the civil war in Libya (2011), the migration from Syria to Turkey (2012 and later), the downing of the reconnaissance plane of the Turkish Air Force by Syria (2012), the official declaration of the civil war in Syria (2012), Turkey -IŞID conflict (2013- present), Russia-Ukraine crisis (2014), operations in Syria (2015, 2016, 2018, 2019, 2020), Russian Su-24 downing (2015), Paris terrorist attack (2015), July 15 coup attempt (2016), Brexit referendum (2016), North Korean nuclear crisis (2017), Turkish convoy attacked by Syria in Idlib (2020), Covid-19 pandemic (2019), Russia and Ukraine war (2022). The events that started with the "Arab Spring events" were soon replaced by armed conflicts. Parallel to these events, the war on Turkey's southern border triggered terrorist incidents in many cities of the country. Some of these incidents are as follows: Police attack in Hatay (2010), terrorist attack in Diyarbakır-Silvan (2011), car bomb explosion in Ankara Kızılay Kumrular Street (2011), terrorist attack in Bingöl (2011), terrorist attack in Çukurca district of Hakkari (2011), the attack on the Police Department in Kayseri (2012), the conflict in the Hakkari-Dağlıca region (2012), the bomb attack in Gaziantep (2012), the Cilvegözü attack (2013), the Hatay-Reyhanlı attack (2013), the Şanlıurfa- Suruç attack (2015), Hakkari- Yüksekova district Dağlıca region attack (2015), Ankara Station attack (2015), Sultanahmet Square attack (2016), Ankara Kızılay attack (2016), Istanbul Atatürk Airport terrorist attack (2016), near Vodafone Arena Stadium and Maçka Park such as two attacks (2016).

In some of these incidents, touristic areas were directly targeted. For example, as a result of the September 11 terrorist attack, tourists in the United States made 20% to 50% reservation cancellations to accommodation establishments (Goodrich, 2002). Again, after this attack, the airline transportation sector suffered great financial losses (Inglada & Ray, 2004). Apart from this incident, 146 people were killed in 3 separate bomb attacks in Paris, the capital of France, in 2015; In 2016, 32 people were killed in attacks on the Belgian

capital Brussels national airport and metro station. According to STR data, the hotel occupancy rate, which was 82% a few days before the Brussels explosion in 2016, dropped to 25% in the 7-day period immediately after the explosion, while there was a 136% decrease in flight bookings to Brussels. Again, after the 2015 Paris explosions, flight ticket cancellations to Paris decreased by 101%, hotel occupancy rates experienced a loss of 15.1% compared to previous years. Likewise, as a result of the explosion in London, hotel occupancy rates suffered a loss of 27.7% (Acar & Çetin, 2017). There is no doubt that Turkey is one of the countries that have to fight terrorism the most. Apart from this, many events such as the terrorist attack in Istanbul Reina, the Istanbul Vodafone Park, Istanbul Sultanahmet, Ankara Kızılay attacks had echoes in the world press. One of the main purposes of these terrorist incidents is to damage the national and regional economy by damaging the image of the country through the press and media. Apart from terrorist incidents, many political and social events both inside and outside the country have also affected the tourism sector. For example, the plane crash with Russia in 2015 and the assassination attempts on the Russian Ambassador in 2016 caused serious tension between Russia and Turkey. Thus, tourism activities between the two countries have come to a standstill. Some political problems with the US, Dutch, and Israeli governments also caused serious damage to the Turkish tourism sector. Likewise, as a result of the coup attempt on July 15, the number of tourists in the previous year decreased by about 11 million (TÜRSAB, 2023).

In the light of this information, it has become a necessity to examine the effect of geopolitical risks on tourism in this study. Because research on the impact of geopolitical risks on tourism is limited (Lee et al. 2020). However, it is seen that there is an increase in both geopolitical risks and geo-economic tensions in the world today.

Figure 1. Historical Geopolitical Risk Index



Source: Caldara ve Iacoviello (2022).

In the geopolitical risk index in Figure 1, it is seen that the geopolitical risk index was high during the September 11 terrorist attack, the Iraq war, the tensions in the Middle East, the Paris attack, the Brexit process, and the tensions between North Korea and the USA. In recent times, examples such as the Russia-Ukraine war, the impact of which has been deeply felt by most countries, have caused disintegration among the major world economies. Therefore, it becomes more and more important to answer questions related to geopolitical risks (Ghosh, 2022; Bouoiyour, Selmi, Hammoudeh & Wohar, 2019).

In this setting, the question of whether geopolitical risk in Turkey and tourism-related activities are related arises. Although finding an answer to this question is necessary, it is anticipated that the findings will add to the body of literature. With the use of the Fourier Toda Yamamoto (TY) causality test and the fractional Fourier TY causality test, the study's objective is to investigate the connection between geopolitical risk and tourism in Turkey. The amount of visitors visiting Turkey, geopolitical risk, Brent oil, real effective currency rate, and CPI variables were all used to study this link between 2003:02 and 2021:01.

The study consists of six chapters. These sections are: introduction, literature review, variables and data set, methodology, empirical findings, respectively. The conclusion follows next.

The Relationship between Tourism and Geopolitical Risk: A Literature Review

Traveler arrivals, travel imports, the number of overnight stays, and other indices of tourism development can all be significantly impacted by geopolitical tensions or threats, which also cause market swings or uncertainty (Lanouar & Goaied, 2019). In this context, current studies examining the relationship between geopolitical risk factors (such as war, political crisis, terrorism) and tourism in the world and in Turkey are given below.

Chiang-Lee, Olasehinde-Williams, and Akadiri (2020) investigated the impact of geopolitical concerns on demand for international travel. A sample of 16 nations was drawn between January 2005 and December 2017. The findings demonstrate that geopolitical risk has a negative influence on tourism demand, and pandemic outbreaks exacerbate this impact.

Geopolitical threats' impact on tourism was examined by Demir, Gözgör, and Paramati (2019) using panel data from 18 nations for the years 1995 to 2016. The findings demonstrate that geopolitical risks have a negative effect on tourism.

With the aid of Wavelet analysis, Tiwari, Das, and Dutta (2019) looked at how economic policy uncertainty and geopolitical concerns affected Indian tourism. The results show that geopolitical risks have a greater influence than economic policy uncertainties. Additionally, geopolitical risks affect visitor arrivals over the long run, and economic policy uncertainty affects them over the near term.

Geopolitical risk's contribution to understanding India's tourism demand was examined by Ghosh in 2022. Geopolitical risk was found to have a negative impact on foreign travel in the study, which used the cointegration method. The Granger causality test also supports the one-way causality between geopolitical risk and tourism as well as between economic uncertainty and tourism.

The impact of geopolitical risk on the Borsa Istanbul (BIST) tourism index and visitor arrivals was examined by Polat, Alptürk, and Gürsoy in 2021. Time series analysis techniques were applied to the data from January 1998 to October 2020. The results show that the BIST tourist index and Turkey's geopolitical risks have an unbalanced relationship. Returns on tourism BIST significantly decline as geopolitical risks in Turkey rise. Likewise, BIST tourism returns rise when risk goes down. On the other side, the decline in Turkey's geopolitical risk results in a rise in visitor numbers.

From January 1999 through August 2020, Hailemariam & Ivanovski (2021) looked at how geopolitical risk affected the demand for tourism services exported from the US. It was done using the structural VAR model. The findings show that geopolitical risk has a negative and considerable impact on exports of tourism-related services.

A non-linear autoregressive distributed lag model was used by Demir, Simonyan, Chen, and Lau (2020) to investigate how geopolitical concerns affected travelers to Turkey between January 1990 and December 2018. This practice causes a decline in the number of tourists visiting Turkey, although a rise in GPRI has no immediate effects.

Geopolitical risks (GPRs), economic policy uncertainty (EPU), and tourist arrivals in South Korea were examined by Kazakova & Kim in 2021. Whether people from China and Japan were impacted by South Korean geopolitical developments and economic changes between January 2003 and November 2019 is the subject of the study. The findings show that GPR and EPU play a significant role in explaining fluctuations in the number of Chinese and Japanese tourists traveling to South Korea.

Zhang, Jiang, Gao, and Yang (2022) used the TVP-VAR model to analyze the connection between EPU, geopolitical concerns, and tourism. According to empirical studies, unpredictably shocks on tourist arrivals have considerably time-varying properties, and the direction of the effect changes.

In the example of Turkey, Akadiri, Eluwole, Akadiri, and Avcı (2020) looked at the causal relationship between the geopolitical risk index, tourism, and economic growth. According to empirical findings from a multivariate causality analysis that used quarterly frequency data from 1985Q1 to 2017Q4, there is a unidirectional causal relationship between the geopolitical risk index and both economic growth and tourism.

The impact of the Geopolitical Risk (GPR) Index on the cash holding decisions of 166 listed lodging firms in Malaysia, Mexico, Thailand, Turkey, Argentina, Brazil, and China from 2008 to 2017 was explored by Demir, Diez-Esteban, and Garcia-Gómez (2019). The findings demonstrate that geopolitical risks have a detrimental impact on lodging

enterprises' cash holdings and support their strong reliance on geopolitical turbulence.

Gazopoulou (2011), sought to investigate how terrorist acts between 1980 and 2009 affected travel to Greece. Contrary to expectations, they discovered that terrorist attacks barely have any impact on traveler demand.

In their 2002 study, Aly and Strazicich sought to determine whether temporary effects of external shocks like terrorism on travel demand for Egypt (1995–1997 timeframe) and Israel (1971–1997) existed. They discovered that both countries' tourism demand shocks had only short-term consequences.

In India between 2006 and 2012, Ranga and Pradhan (2014) calculated the association between tourism and terrorism. They came to the conclusion that they were unaffected by terrorism, tourism, and other political factors in their study, which used a variety of methodologies.

Güvenek and Alptekin (2015), in their study in which they analyzed whether the terrorist attacks against tourists in Turkey during the 1993–2008 period negatively affected the tourism of the country, concluded that terrorist attacks did not have a significant effect on the number of tourists.

Muzindutsi and Manaliyo (2016) analyzed the relationship between political risk and tourism revenues for South Africa in the period of January 2007-December 2015 with the ARDL test approach. In their analysis, there is no relationship between political risk and tourism revenues in the short run.

Neumayer (2004) examined the impact of political violence on the tourism sector. According to the findings, it has been concluded that violence in the political arena, human rights violations, conflicts and other politically motivated violence negatively affects the tourist network and accordingly the tourism sector.

Within the scope of the literature examined in the light of this information, it is seen that factors such as geopolitical risks, terrorism, political violence, and political risk are effective or ineffective on variables such as the number of tourists, tourism demand, and variables such as the BIST Tourism Index. However, it can be said that this effect is generally negative.

Variables, Dataset and Model

The dependent variable

Tourist arrivals is the dependent variable. The unit of measure is the number of tourists. In this study, monthly observations from February 2003 to January 2021 are discussed. The data source for TOUR is available at the URL: https://www.tursab.org.tr.

Explanatory variables

The most significant explanatory variable is geopolitical risk (GPR). Using datasets

created by Caldara and Iacoviello (2021), monthly observations were acquired between February 2003 and January 2021. Available at URL: https://www.policyuncertainty.com/gpr.html

The GPR index displays the pre-programmed search results of electronic archives of national and international daily newspapers, claim Caldara & Iacoviello (2021). An index was made utilizing keywords associated with geopolitical concerns in these search results (nuclear threats, acts of war and terrorist acts, war threats and terrorist threats).

The GPR index serves as the primary explanatory variable in the study's current econometric model. By analyzing the connection between GPR and tourism, this study contributes to the body of empirical research already available. By examining whether the GPR is a significant estimator of the number of foreign visitors visiting Turkey, the value of the GPR in the development of the tourism industry has been examined.

Other explanatory variables are Real Effective Exchange Rate (REER), Consumer Price Index (CPI), Brent Oil (BRENT). Data for REER and CPI are taken from the TCMB page. Current URL: https://evds2.tcmb.gov.tr. The data of Brent petroleum is taken from investing.com tr address.

In this study, the model described below was used to examine the relationship between the number of tourists and the geopolitical risk index:

Model:

$$\ln TOUR = \alpha_0 + \alpha_1 \ln GPR + \alpha_2 \ln REER + \alpha_3 \ln BRENT + \alpha_4 CPI + e_t$$

In this model, the number of tourists, geopolitical risk index, real exchange rate and CPI variables are used to reveal the relationship in question. Descriptive statistics of the variables are given in Table 1.

Table 1. Descriptive Statistics

	TOUR	GPR	BRENT	REER	CPI
Mean	6.2759	2.0627	1.8155	2.0022	0.7887
Med.	6.2866	2.0643	1.8176	2.0210	0.7000
Max.	6.8206	2.4011	2.1456	2.1062	6.3000
Min.	4.3844	1.7142	1.3743	1.7807	-1.4400
Std. Dev.	0.3263	0.1395	0.1756	0.0751	0.8639
Skew.	-1.7889	0.0282	-0.3230	-1.1821	1.3278
Kurt.	10.9578	2.3978	2.4906	3.7104	9.8582
J-B.	685.1581	3.2922	6.0909	54.852	486.8003
Prob.	0.0000	0.1927	0.0475	0.0000	0.0000
Sum	1355.616	445.5494	392.1603	432.4808	170.3800
Sum Sq. Dev.	22.9003	4.1876	6.6349	1.2128	160.4701
Obs.	216	216	216	216	216

Method

While examining the causality relationship between the variables, Granger (1969) causality method is mostly used. This method is based on the VAR model and if the series are not stationary, the analysis is made by taking the first difference. However, when the difference of the series is taken, it may cause a loss of information in the long term. To solve this negative situation, Toda-Yamamoto (1995) Granger causality method was developed. Both the Granger (1969) and Toda-Yamamoto (1995) tests, which are among the traditional causality methods, do not take structural changes into account. Therefore, causality tests may give biased results in analyses made with series containing structural breaks.

Enders and Jones (2016) extended the Granger causality approach with Fourier functions, while Nazlıoglu, Görmüş, and Soytaş (2016) extended the Toda-Yamamoto causality method with Fourier functions to create a method that takes structural changes into consideration. The assumption that the constant term does not vary over time has been expanded in order to take into account structural breaks in the Fourier Toda-Yamamoto causality analysis, which was introduced to the literature by Nazlıoglu, Görmüş, and Soytaş (2016). Thus, the formulation of the VAR (p+d) model is 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):

$$\alpha(t) = \alpha_0 + \sum_{k=1}^{n} \alpha_{1k} \sin(\frac{2\pi kt}{T}) + \sum_{k=1}^{n} \alpha_{2k} \cos(\frac{2\pi kt}{T}) \quad (2)$$

In equation (2), the symbol n represents the frequency number between 1 and 5, the symbol T represents the number of observations and k the frequency value. A large value for n may result in stochastic parameter variation and an overfitting problem may arise. Therefore, the Single Fourier function tries to fill with deterministic components, ignoring the break sites, date, number and form (Nazlıoglu et al., 2016). The established model is as in equation (3).

$$\alpha(t) = \alpha_0 + \alpha_{1k} \sin(\frac{2\pi kt}{T}) + \alpha_{2k} \cos(\frac{2\pi kt}{T}) \quad (3)$$

Equation (4) is obtained by substituting equation (3) in equation (1).

$$y_t = \alpha_0 + \alpha_{1k} \sin(\frac{2\pi kt}{T}) + \alpha_{2k} \cos(\frac{2\pi kt}{T}) + \beta_1 y_{t-1} + \ldots + \beta_{p+d} y_{t-(p+d)} + \varepsilon_t \quad (4)$$

Empirical Findings

Find out if the series is stationary before using the Fourier TY causality test. The stationarities were examined using ADF and FADF tests. The alternative hypothesis in the FADF unit root test is that the series is stationary. If the calculated statistical value is greater than the critical value in the absolute value, the hypothesis, which states that the series is not stationary, is rejected and the alternative hypothesis is accepted.

Table 2. Fourier ADF Unit Root Test Results (t=216)

Variables		Frequency (k)	Ft	Ap. lag length	FADF
TOUR	Constant	1	6.15379	2	-8.517571
	Const. + trend	1	5.69576	2	-8.504975
GPR	Constant	1	5.50957	4	-4.368547
	Const. + trend	1	4.05057	4	-4.351443
REER	Constant	1	1.89395	4	-1.355982
	Const. + trend	1	6.54364	3	-4.282945
BRENT	Constant	3	1.77496	1	-3.075570
	Const. + trend	3	1.74956	1	-3.059390
CPI	Constant	1	4.39736	3	-9.247755
	Const. + trend	1	3.94346	3	-9.694493

Table 3. Significance of Trigonometric Terms Test Results

Model	Variable	Calculated test statistics value	Critical Values		
			%1	%5	%10
Constant	**TOUR**	-8.517571*	-3.93	-3.26	-2.92
	GPR	-4.368547*	-3.62	-2.98	-2.65
	REER	-1.355982	-3.62	-2.98	-2.65
	BRENT	-3.075570	-4.37	-3.78	-3.47
	CPI	-9.247755*	-3.74	-3.06	-2.72
Constant and trend	**TOUR**	-8.504975*	-4.62	-4.01	-3.69
	GPR	-4.351443*	-4.27	-3.63	-3.31
	REER	-4.282945**	-4.38	-3.77	-3.43
	BRENT	-3.059390	-4.87	-4.02	-4.81
	CPI	-9.694493*	-4.38	-3.77	-3.43

In Table 3, it is seen that TOUR, GPR and CPI variables do not contain unit roots in both fixed and trend models. The REER variable is only constant and there is no unit root in the trend model. Because the calculated test statistic value is greater than the absolute critical values. According to the results of the Fourier ADF test, the stationarity of the said variables requires testing the significance of the trigonometric terms. In this context, the

critical values in Table 4 are used to test the significance of the trigonometric terms.

Table 4. Critical Values

Model	Critical Values		
	%1	**%5**	**%10**
Constant	11.52	8.76	7.53
Constant and trend	9.78	7.29	6.16

According to the results in the table, it was concluded that the trigonometric terms were not significant for both models. Because when the critical values in Table 4 are compared with the F statistics values in Table 2 and Table 3, it is seen that the trigonometric terms are not significant. In this case, it is more appropriate to use traditional unit root tests, as suggested by Enders and Lee (2012). ADF unit root test results from traditional unit root tests are given in Table 5.

Table 5. ADF Unit Root Test Results

		ADF				
		Level		First differiences		
		Test ist.	**Prob**	**Test ist.**	**Prob**	**Decision**
Constant	**TOUR**	-1.5611	0.5006	-2.9601	0.0405	I(1)
	GPR	-2.9031	0.0467	-11.6864	0.0000	I(0)
	REER	0.0358	0.9599	-8.1943	0.0000	I(1)
	BRENT	-2.9442	0.0421	-11.5466	0.0000	I(0)
	CPI	-2.8505	0.0532	-9.4898	0.0000	I(0)
Constant and trend	**TOUR**	-0.0738	0.9950	-4.1762	0.0058	I(1)
	GPR	-3.3666	0.0588	-11.6374	0.0000	I(0)
	REER	-1.8425	0.6805	-8.4124	0.0000	I(1)
	BRENT	-2.8358	0.1862	-11.5919	0.0000	I(1)
	CPI	-3.5436	0.0375	-9.4886	0.0000	I(0)

As a result of the ADF unit root test obtained, GPR, BRENT and CPI in the fixed model, GPR and CPI in the fixed and trend model are stationary at the level, that is, I(0). Other variables are aware stationary in both fixed and constant and trend models. In other words, the decision for the variables is I(1). After the stationarity levels of the variables are determined, the stage of determining the lag levels is started with the help of information criteria. The results regarding this are given in Table 6.

Table 6. Appropriate Delay Length Test Results

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**

0	172.3805	NA	1.38e-07	-1.609428	-1.529198	-1.576987
1	971.5633	1552.259	8.05e-11	-9.053493	-8.572117	-8.858849
2	1073.031	192.2035	3.86e-11	-9.788760	**-8.906238***	**-9.431914***
3	1104.476	58.05149	3.63e-11*	-9.850727*	-8.567059	-9.331677
4	1126.570	39.72773	3.74e-11	-9.822790	-8.137975	-9.141538
5	1147.206	36.11350	3.91e-11	-9.780831	-7.694870	-8.937376
6	1169.640	38.18073	4.03e-11	-9.756157	-7.269050	-8.750499
7	1195.985	43.57012*	4.01e-11	-9.769087	-6.880833	-8.601226
8	1216.131	32.34977	4.23e-11	-9.722414	-6.433013	-8.392349

Table 6 shows the appropriate lag lengths determined by the information criteria. The appropriate delay length according to SC and HQ is the 2nd 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 7.

Tablo 7. Fourier Toda-Yamamoto Causality Analysis Results

	Test stats	**Boostrap prob.**	**Appropriate delay (p)**	**Appropriate frequency (k)**
GPR=>TOUR	2.483	0.290	2	1
REER=>TOUR	0.946	0.618	2	1
BRENT=>TOUR	54.403*	0.000	2	1
CPI=>TOUR	12.168*	0.003	2	1
TOUR=>GPR	2.631	0.270	2	1
REER=>GPR	1.666	0.437	2	1
BRENT=>GPR	0.297	0.858	2	1
CPI=>GPR	4.431	0.111	2	1
TOUR=>REER	0.369	0.823	2	1
GPR=>REER	0.849	0.652	2	1
BRENT=>REER	0.283	0.865	2	1
CPI=>REER	4.247	0.121	2	1
TOUR=>BRENT	8.750**	0.016	2	1
GPR=>BRENT	0.117	0.948	2	1
REER=>BRENT	1.252	0.528	2	1
TÜFE=>BRENT	2.821	0.236	2	1
TOUR=>CPI	4.543	0.105	2	1
GPR=>CPI	0.735	0.688	2	1
REER=>CPI	25.934*	0.000	2	1
BRENT=>CPI	4.117	0.132	2	1

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

According to the Fourier TY causality test results, there is a causality relationship from BRENT and CPI variables to TOUR variable, from TOUR variable to BRENT variable, and from REER variable to CPI variable. In other words, there is a bidirectional causality relationship between BRENT and TOUR, and a unidirectional causality relationship from CPI to TOUR and from REER to CPI. For the other variables, a causal relationship could not be determined.

More broadly, the result of the Fourier TY causality test shows that there is no causal relationship between the number of tourists and geopolitical risk, which is the aim of the current study. It is seen that inflation and oil prices, which are determined as control variables, are variables that determine or affect the number of tourists.

In addition, Fractional Fourier TY causality test was also performed to test whether the shocks are permanent. The results regarding this are shown in Table 8.

Table 8. Fractional Fourier TY Causality Test Results

	Test stats	**Boostrap prob.**	**Appropriate delay (p)**	**Appropriate frequency (k)**
GPR=>TOUR	0.876	0.646	2	0.20
REER=>TOUR	1.338	0.503	2	0.20
BRENT=>TOUR	48.019*	0.000	2	0.20
CPI=>TOUR	11.257*	0.004	2	0.20
TOUR=>GPR	4.353	0.114	2	0.20
REER=>GPR	1.405	0.493	2	0.20
BRENT=>GPR	0.514	0.767	2	0.20
CPI=>GPR	3.739	0.161	2	0.20
TOUR=>REER	0.796	0.660	2	0.20
GPR=>REER	0.613	0.739	2	0.20
BRENT=>REER	0.032	0.984	2	0.20
CPI=>REER	3.042	0.219	2	0.20
TOUR=>BRENT	10.067**	0.012	2	0.20
GPR=>BRENT	0.120	0.939	2	0.20
REER=>BRENT	1.839	0.396	2	0.20
CPI=>BRENT	3.386	0.182	2	0.20
TOUR=>CPI	5.015***	0.087	2	0.20
GPR=>CPI	0.522	0.772	2	0.20
REER=>CPI	26.111*	0.000	2	0.20
BRENT=>CPI	4.289	0.119	2	0.20

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

According to the results obtained from the fractional Fourier TY causality test, it is seen that there is a bidirectional causality relationship from BRENT and CPI to TOUR, from TOUR to BRENT and CPI. In addition, there is a one-way causality relationship from

REER to CPI. The results show that the shocks are permanent.

As with the results of the Fourier TY causality test, the fractional Fourier TY causality test results also show that there is no causal relationship between the number of tourists and geopolitical risk. According to the results of both tests, it is noteworthy that there is no causal relationship between geopolitical risk and the number of tourists. Another remarkable point is that there is a causal relationship between inflation and oil prices, which are used as control variables, and the number of tourists. Economic theory expresses the inflation rate of the host country of tourists as one of the main variables of tourism demand (Lee et al., 1996). In terms of tourism, the inflation rate causes the prices of many variables such as transportation, accommodation, food, and beverage services to increase (Delisle & Venne, 2005). Therefore, the theory in question confirms the result of the present study. In addition, tourism is heavily dependent on oil for transportation. The travel industry is adversely affected by the fluctuations in oil prices. Because the increase in oil prices creates uncertainty about prices. Due to this uncertainty, price increases are passed on to customers (Becken & Lennox, 2012).

Conclusion

GPR shocks have an immediate, detrimental effect on supply-side tourism flow. A higher GPR may cause attractions to close, direct flights to be canceled, the supply of tourists to be interrupted, and vacation plans to be postponed or canceled. Therefore, policy holders must be aware of how risks and uncertainties on a local and global scale affect tourism.

With Turkey being the focal point of current geopolitical tensions, it is planned to look into the connection between geopolitical risk and travel there. Fourier TY and Fractional Fourier TY causality analysis were used in the study to investigate the relationship between the variables (control variables; Brent oil, real effective exchange rate, and CPI) affecting the number of tourists in the context of geopolitical risk in Turkey from 2003:02 to 2021:01.

According to the Fourier TY causality test results, there is a causal relationship from the BRENT and CPI variables to TOUR variable, from TOUR variable to BRENT variable, and from REER variable to CPI variable. In addition, according to the results of the Fractional Fourier TY causality test performed to test whether the shocks are permanent, it is seen that there is a causal relationship from BRENT and CPI to TOUR, from TOUR to BRENT and CPI. In addition, there is a one-way causality relationship from REER to CPI. The results show that the shocks are permanent.

When the findings are compared with the literature, the following conclusions are reached. (i) studies examining the relationship between geopolitical risk and tourism; a negative relationship (Chiang- Lee, Olasehinde-Williams & Akadiri (2020); Demir, Gözgör & Paramati (2019); Polat, Alptürk & Gürsoy (2021); Hailemariam & Ivanovski (2021); Demir, Simonyan, Chen & Lau (2020)) and one-way causality from geopolitical risk to tourism

(Ghosh (2022); Akadiri, Eluwole, Akadiri & Avci (2020)). However, no causal relationship was found in the current study. (ii) It is possible to see different results in studies examined in the context of terrorism and tourism. For example, between two variables; low impact (Gazopoulou (2011)), transient shocks (Aly & Strazicich (2002)) and no impact (Ranga & Pradhan (2014)). (iii) There are studies where there is no short-term effect between political risk and tourism (Muzindutsi & Manaliyo (2016)) and there is no significant effect between the two variables (Guvenek & Alptekin (2015)). (iv) Also it is possible to see study (Neumayer (2004)) in which political violence negatively affects tourism.

This result; studies examining the relationship between terrorism and tourism (Gazopoulou (2011), Aly & Strazicich (2002), Ranga & Pradhan (2014)) and studies examining the relationship between political risk and tourism (Muzindutsi & Manaliyo (2016), Güvenek & Alptekin (2015)) partially consistent with the results.

In addition, it is noteworthy that there is a causal relationship between the control variables used in the current study -inflation and oil price- and the number of tourists. This is because tourism is greatly affected by inflation and oil prices. In recent years, many political, social, and economic events (the COVID-19 pandemic, the Russia-Ukraine war, the energy and grain crises) both inside and outside the country have both increased oil prices and adversely affected food prices. Because both the transportation sector and the accommodation-food sector directly or indirectly affect the tourism sector.

The findings obtained are of great importance in terms of tourism in Turkey. Because, although research is carried out in the context of geopolitical risk, there is a relationship between the risks and uncertainties in macroeconomic factors and the tourism sector. Instability, both inside and outside the country, affects the country's economy. In this case, policymakers have an important role to play. Factors that will increase the risk factor of the country should be determined, and measures should be taken to reduce those factors with appropriate policies.

In addition, studies examining the relationship between geopolitical risks and tourism can be expanded in the future by using different variables and different econometric techniques. In particular, it can investigate the effects of geopolitical, economic, or financial risks or uncertainties on tourism (number of tourists, tourism revenues).

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