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THE IMPACT OF COVID 19 PANDEMIC ON THE TOURISM AND TRANSPORTATION SECTORS: EVIDENCE FROM BORSA ISTANBUL

COVID 19 SALGININ TURİZM VE ULAŞTIRMA SEKTÖRLERİ ÜZERİNDEKİ ETKİSİ: BORSA İSTANBUL'DAN KANITLAR

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ABSTRACT

The Covid-19 pandemic is recognized as one of the most important pandemics of the last century and has led to a global recession and decline, affecting all sectors in different ways. In this study, volatility spillovers between variables are analyzed. In this context, Covid daily case count, volatility spillovers between Borsa Istanbul tourism and transportation indices are examined with the EGARCH model using daily data covering the period 15 March 2020- 31 May 2022. According to the results of the conditional variance equation derived from the EGARCH model, it is determined that there is a volatility spillover from the Covid variable to the tourism and transport indices, but this volatility interaction is not asymmetric and positive and negative shocks do not have any effect on the volatility of these indices.

Keywords: *Covid, Tourism, Transportation Index, EGARCH*

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ÖZ

Covid-19 salgını, son yüzyılın en önemli salgınlarından biri olarak kabul edilmekte ve tüm sektörleri farklı şekillerde etkileyerek küresel bir durgunluk ve gerilemeye yol açmıştır. Bu çalışmada, değişkenler arasındaki oynaklık yayılımı incelenmektedir. Bu kapsamda, Covid günlük vaka sayısı, Borsa İstanbul turizm ve ulaştırma endeksleri arasındaki oynaklık yayılımı, 15 Mart 2020- 31 Mayıs 2022 dönemini kapsayan günlük veriler kullanılarak EGARCH modeliyle incelenmiştir. EGARCH modelinden çıkarılan koşullu varyans denklemi sonuçlarına göre Covid değişkeninden turizm ve ulaştırma endekslerine doğru bir oynaklık yayılımının olduğu, ancak bu oynaklık etkileşiminin asimetrik bir yapıda olmadığı, pozitif ve negatif şokların söz konusu endekslerin oynaklığı üzerinde herhangi etkiye sahip olmadığı tespit edilmiştir.

Anahtar Kelimeler: *Covid, Turizm, Ulaştırma Endeksleri, EGARCH*

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Introduction

Over the past 40 years, the world has faced a number of major outbreaks and pandemics, but none has had such a profound impact on the global economy as the COVID-19 pandemic. A case of pneumonia of unknown cause in Wuhan, China, was first reported to the World Health Organization (WHO) Country Office in China on 31 December 2019. In early January 2020, 41 patients with a new coronavirus (COVID-19) infection were treated in hospitals in China. Although the virus spread rapidly in the Wuhan region and intelligence services warned of a possible catastrophe, it was initially largely overlooked by political leaders worldwide. International, regional and local travel restrictions have had an immediate impact on national economies, deeply affecting tourism systems. This covers a wide range of areas such as international travel, domestic tourism, day trips and air transport, cruises, public transport, accommodation, cafes and restaurants, congresses, festivals, meetings and sporting events. International and domestic tourism started to decline rapidly within a few weeks as a result of the rapid stoppage of international air travel due to the pandemic and many countries-imposed travel bans, closed borders or imposed quarantine periods (Gössling et al., 2021:2).

Tourism is a vital sector for rapidly growing economies. In 2019, approximately 10 per cent of total income worldwide was generated from the tourism sector. Tourism, which is widely used as a tool in the development process of countries, significantly affects the macro variables of national economies, especially thanks to the rapid progress in information and transport technologies. When the tourism activities of both developed and developing countries are analyzed, it is observed that the progress in the sector positively affects national income, employment and tax revenues and plays an important role in reducing economic imbalances (Yavuzaslan, 2022:71).

The concept of tourism emerged as people began traveling beyond their usual places of residence for work, leisure, and relaxation. With the acceleration of globalization, individuals increasingly prefer destinations that offer cheaper, higher-quality, accessible, and skilled labor. This trend positively impacts the economy by bringing foreign currency into countries. However, some negative events are also occurring with the effect of globalization. One of the most significant of these adverse events is pandemic diseases such as Covid-19, which is among the unpredictable situations we are experiencing today. Since the 1980s, Türkiye's tourism sector has experienced substantial growth and has increased both foreign exchange earnings and the country's image in a positive way. However, there are also various factors that negatively affect Türkiye's tourism sector. Terrorist incidents, political and political developments and the COVID-19 pandemic can be counted among these factors. During the pandemic period, many accommodation, transport and catering sectors temporarily ceased their activities or had to go bankrupt. This situation caused seasonal workers to become unemployed and the unemployment rate to increase. The study investigates the financial performance of the transportation and tourism sectors, which are among the most affected by COVID-19. In this context, the primary aim of the study is to measure the impact of the COVID-19 pandemic on the transportation and tourism sectors in Türkiye and to expand knowledge on this topic to serve as a reference for students, researchers, tourism entrepreneurs, and consultants. The study utilizes daily data on COVID-19 case numbers, and the BIST tourism and transportation indices for the period from March 15, 2020, to May 31, 2022. The study is composed of the introduction, conceptual framework, literature review, research methodology, findings and discussion and conclusion sections.

1. Historical Development of Tourism

Tourism is known to have begun with the sea voyages of Phoenician merchants in the Mediterranean in ancient times. Subsequently the Phoenicians were followed by the Ancient Greeks and Romans. Particularly during the Roman Empire with an emphasis on road construction, inns were built for soldiers, other travelers and merchants for long journeys which were used for accommodation purposes, leading to the emergence of the first lodging facilities in history. In the Middle Ages, significant events contributing to the development of tourism include the Silk Road Trade, the Crusades and Marco Polo's journey to China. The Silk Road's stretch from China to India, the Middle East and Western Europe facilitated reciprocal travel for merchants to buy and sell goods, consequently fostering the development of tourism. Similarly, the Crusades which began in the 11th century for religious reasons led to an increase in travel for pilgrimage purposes, further contributing

to the advancement of tourism. Factors that have influenced the development of tourism in the Early and Modern Ages include the Renaissance movements, Vasco De Gama's voyage to India in 1492, the circumnavigation of the globe by Portuguese navigator Magellan the settlement of people in newly discovered continents leading to the establishment of new cities and trade centers and the beginning of travel for political, artistic and scientific reasons. In the 18th century, the Industrial Revolution and urbanization along with population and income growth, accelerated tourism activities. Travel agencies were established for pre-planned trips and with the widespread of travel for exploration and leisure rather than commercial and military purposes, tourism activities flourished (Akat, 2000:7-9; Toskay, 1987:38).

1.1. Tourism Sector in The World

The phenomenon of tourism rapidly expanded to distant destinations and broad audiences after the second half of the 20th century. Throughout the latter half of the 20th century, the tourism sector emerged as one of the fastest growing and most significant sectors in the global economy. Today, technological advances, rising living standards and globalization have increased the freedom of travel, leading to a rapid increase in the number of people participating in tourism activities. The number of tourists, which was 25 million in 1950, increased to 70 million in 1960, 166 million in 1970, 277 million in 1980, 435 million in 1990, 674 million in 2000, 949 million in 2010 and reached 1.46 billion in 2019 before the COVID-19 pandemic. However, due to the COVID-19 outbreak, there were significant decreases in the number of people participating in international tourism activities in 2020, 2021 and 2022. During these years, the number of international tourists decreased to 407 million, 456 million and 963 million, respectively. International tourism revenues have also significantly decreased in parallel with the decline in the number of international tourists. The revenue, which was $2.1 billion in 1950, increased to $6.9 billion in 1960, $17.9 billion in 1970, $105 billion in 1980, $271 billion in 1990, $495 billion in 2000, $966 billion in 2010 and reached $1.494 trillion in 2019. However, it decreased to $559 billion in 2020, $638 billion in 2021 and $1.031 trillion in 2022 (UNWTO; 2000, 2006, 2010, 2012, 2015, 2020 and 2023).

Table 1: International Tourist Arrivals By Region 1980-2023 (Million)

Years	1980	1990	2000	2010	2019	2020	2021	2022	2023
World	277	435	674	949	1.464	407	458	969	1.286
Europe	173.3	261.5	386.4	488.9	742.1	239.6	301.3	594.9	700.4
Asia/ Pacific	22.8	55.8	110.3	205.4	630.1	59.1	24.8	102.3	233.4
Americas	62.3	92.8	128.2	150.1	219.3	69.6	81.7	156.2	198.3
Africa	7.2	14.7	26.2	49.5	69.1	18.7	19.6	46.6	66.4
Middle East	7.1	9.6	22.4	54.7	72.9	19.8	30.8	69.3	87.1

Source: (UNWTO; 2015,2016, 2023, 2024 edition)

When Table 1 is analyzed, it is evident that the tourism sector has demonstrated resilience and strength by exhibiting nearly continuous growth in the long term despite occasional shocks. The number of international tourists worldwide increased from 25 million in 1950 to 278 million in 1980, 674 million in 2000, 949 million in 2010 and 1.464 billion in 2019. However, in 2020, 2021 and 2022, there was a decline in the number of international tourists due to the COVID-19 pandemic. The number of tourists participating in international tourism activities was 407 million in 2020, 458 million in 2021 and 969 million in 2022. Although in 2023, the number of individuals participating in international tourism activities reached 1.286 billion, it remained below pre-pandemic levels.

Similarly, international tourism revenues generated by destinations worldwide increased from $2 billion in 1950 to $104 billion in 1980, $495 billion in 2000, $927 billion in 2010 and $1.486 trillion in 2019. Due to the pandemic, there was a significant decrease in these revenues in 2020 and 2021. However, there was a trend of recovery in 2022. In 2023, international tourism revenues reached $1.4 trillion (UNWTO 2012, 2016, 2023 and 2024).

1.2. Tourism Sector in Türkiye

Türkiye boasts a vast tourism potential owing to its rich cultural heritage, historical sites and breathtaking natural landscapes. Situated close to the world's largest tourism market, Türkiye offers diverse tourism opportunities encompassing both winter and summer activities, as well as its unique bays and beaches. When compared to its competitors in the Mediterranean region, Türkiye stands out as a significant tourism destination with relatively newer accommodation facilities. The economic, social and cultural impacts of tourism in Türkiye have been recognized and integrated into government policies parallel to global developments since the second world war. However, from the 1960s to the 1980s, Türkiye experienced slow growth due to various social, economic and political reasons (Dilber, 2007:209).

In Türkiye, the first significant organizational initiative in the field of tourism occurred with the establishment of the Turkish Traveler Society in 1923, following the declaration of the Republic (Oktayer et al., 2007:41).

The legal framework for the tourism phenomenon was established for the first time with Law No. 2450, enacted in 1934, titled "Organization and Duties of the Ministry of Economy" (Yağcı, 2003:17).

In Türkiye, during the period from 1963 to 1980, the primary objective of tourism policy was to create new job opportunities, increase foreign currency revenues, contribute to the balance of payments, and provide vacation opportunities for Turkish citizens (Çoban and Özcan, 2013:244).

The implementation of Law No. 2634, the "Tourism Encouragement Law," in 1982 led to significant developments in the tourism sector in Türkiye. This included increased allocation of resources to the tourism sector, greater collaboration between the private and foreign sectors, the development of tourism awareness, heightened investor interest in tourism, and the implementation of incentive policies within the sector. As a result of the enforcement of Law No. 2634, the Turkish tourism industry transitioned to a dynamic operational model. The implementation of Law No. 2634 encouraged investments by stimulating an increase in tourist demand. Following this date, Türkiye entered a period of rapid development and revitalization in tourism (Kaya and Canlı, 2013:47).

Table 2: Ratio of Tourism Revenues To Export Revenues and Tourism Expenses to Import Expenses (Million)

Years	Export Figures	Tourism Revenues	Ratio of Tourism Revenues to Exports (%)	Import Expenses	Tourism Expenses	Ratio of Tourism Expenses to Imports (%)
1970	588.0	51.6	8.8	948.0	47.7	5.0
1975	1.401.1	200.9	14.3	4.738.7	155.0	3.3
1980	2.910.1	326.7	11.2	7.909.4	114.7	1.5
1985	7.958.0	1.482.0	18.6	11.343.4	323.6	2.9
1990	12.959.3	3.225.0	24.9	22.302.1	520.0	2.3
1995	21.637.0	4.957.0	22.9	35.709.0	912.0	2.6
2000	27.774.9	7.957.0	27.5	54.502.8	1.711.0	3.1
2005	73.476.4	20.322.1	27.7	116.774.2	3.394.6	2.9
2010	113.883.2	24.931.0	21.9	185.554.3	5.874.5	3.2
2015	150.982.1	32.492.2	21.5	213.619.2	5.698.4	2.7
2016	149.246.9	22.839.4	15.3	202.189.2	5.698.4	2,7
2017	164.494.6	27.044.5	16.4	238.715.1	5.137.2	2.2
2018	177.168.7	30.545.9	17.2	231.152.4	4.896.3	2.1
2019	180.832.7	38.930.4	21.5	210.345.2	4.403.6	2.1
2020	169.637.7	14.817.2	8.7	219.516.8	1.104.5	0.5
2021	225.214.4	30.173.5	13.4	271.425.5	1.851.9	0.7
2022	254.191.5	46.284.9	18.2	363.710.5	4.276.5	1.2

Source: (tursab.org.tr)

Table 2 presents the ratio of tourism revenues to export revenues and the ratio of tourism expenditures to import expenditures (%). Upon examining the table, it can be observed that the ratio of tourism revenues to export revenues and the ratio of tourism expenditures to import expenditures followed a fluctuating trend from 1970 to 2022. The ratio of tourism revenues to cover exports was 8.8% in 1970

and decreased to 8.7% in 2020 due to COVID-19. In 2000 and 2005, it reached its highest levels at 27.5% and 27.7%, respectively. On the other hand, the ratio of tourism expenditures to import expenditures was at its highest in 1970 at 5% and reached its lowest level in 2020 at 0.5%. The low ratio of tourism revenues to exports and tourism expenditures to import expenditures in 2020 can be attributed to the impact of travel restrictions implemented worldwide due to the pandemic.

Table 3: Tourist Arrivals, Tourism Revenues, Average Expenditure and Share of Tourism Revenues in GDP (2010-2022) in Türkiye

Years	Tourist Arrivals (Million)	Tourism Revenue (Billion USD)	Average Expenditure ($)	Share of Tourism Income in GDP (%)
2010	28 632 204	24 930 997	755	3.2
2011	31 456 076	28 115 692	778	3.4
2012	31 782 832	29 689 249	814	3.7
2013	34 910 098	33 073 502	843	4
2014	36 837 900	35 137 949	848	4.3
2015	36 244 632	32 492 212	781	3.7
2016	25 352 213	22 839 468	728	2.6
2017	32 410 034	27 044 542	700	3.1
2018	39 566 327	30 545 924	669	3.8
2019	45 058 286	38 930 474	751	5.1
2020	12 734 213	14 817 273	936	2
2021	24 712 266	30 173 587	1028	3.7
2022	44 564 395	46 284 907	901	5.1

Source: (tursab.org.tr)

Analysis of Table 3 reveals a consistent upward trend in both tourist arrivals and tourism revenues from 2010 to 2022, with the exceptions of 2016 and 2020. The downturns witnessed in these years can be linked to significant events such as the attempted coup in July 2016 and the global impact of the COVID-19 pandemic. In terms of average spending per person, the highest level was reached in 2021 with $1,028 per person, while the lowest level was recorded in 2018 with $669 per person. Throughout the period under review, the average spending was determined to be $810 per person. The share of tourism in gross domestic product (GDP) was highest at 5.1% in both 2019 and 2022, and lowest at 2% in 2020 due to the COVID-19 pandemic. In general, the ratio of tourism in GDP was 3.7% on average. In the table, it can be said that the average expenditure increased significantly in 2020, 2021 and 2022, so it can be said that the pandemic increased tourist expenditures.

In Figure 1, significant declines of 25% and 69% are observed in the number of tourists visiting Türkiye in 2016 and 2020, respectively. However, there was an 85% increase in the number of tourists in 2021 compared to the previous year. Tourism revenues have followed a similar trend. Tourism revenues, which were $34.5 billion in 2019, experienced a significant decrease to $12 billion in 2020. With the relaxation of pandemic restrictions in 2021, tourism revenues showed an increase of over 100% compared to the previous year; however, despite this increase, they did not reach the 2019 level.

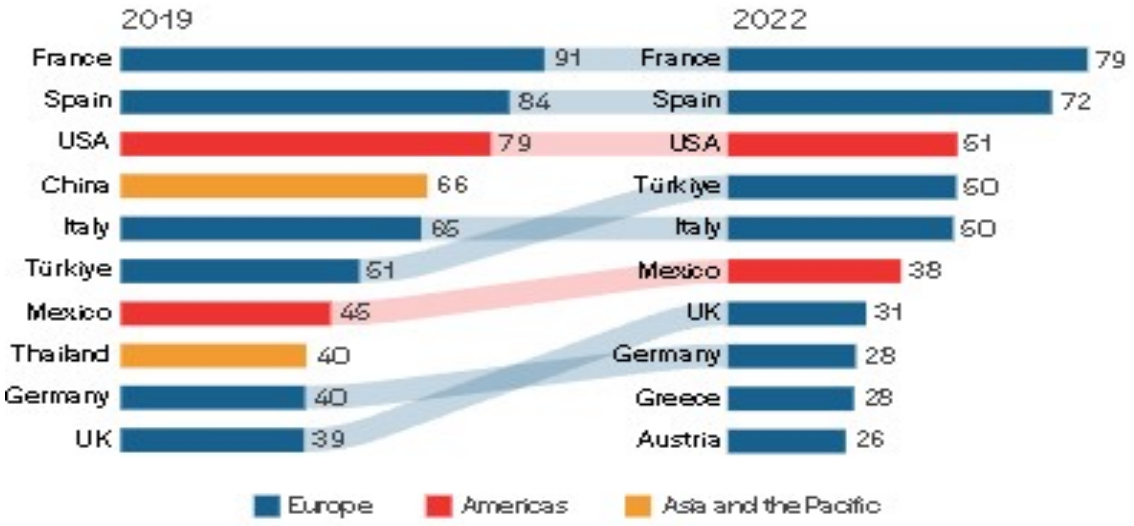
Figure 1: The Change in Tourism Revenues and Number of Tourists For The Period 2013-2021 For Türkiye

Source: (TUİK)

2. Economic Implications of Covid-19 in The Tourism Sector

The COVID-19 pandemic has led to an unprecedented crisis in the tourism sector from 2020 to 2022. Globally implemented lockdowns, widespread travel restrictions, and decreased visitor demand have been the main reasons for this decline. This period has been recorded as the biggest crisis in the history of tourism. The COVID-19 pandemic has caused the largest loss of tourism revenues and economic output ever, affecting millions of jobs, small businesses, and livelihoods, especially in destinations worldwide, particularly in developing small island states where tourism is a significant part of the economy more labor-intensive and a crucial component of the balance of payment. During the pandemic, an estimated 100 million direct tourism jobs were at risk or lost; most of these were in micro, small and medium-sized enterprises that employ a high proportion of women and young people. International tourist arrivals experienced a dramatic decrease, dropping from 1.464 million in 2019 to 407 million in 2020, representing a staggering 72% decline in just one year. Although there was a slight increase in the number of people participating in tourism activities in 2021, it remained below 2019 levels by more than 69%, as the world continued to grapple with the pandemic and most restrictions remained in place. In 2022, there was a partial recovery in international travel due to strong pent-up demand and the easing of restrictions. Although the number of people participating in tourism activities more than doubled compared to 2021, it remained more than 34% below 2019 levels. The pandemic has led to a total loss of 2.6 billion international arrivals in 2020, 2021 and 2022. Export revenues from international tourism decreased by 63% in 2020, 60% in 2021 and 24% in 2022 compared to 2019 levels. The total loss in tourism export revenues totaled USD 2.5 trillion for this three-year period. The pandemic has resulted in a halving of the direct contribution of tourism to gross domestic product (TDGDP), measured by direct tourism gross domestic product, decreasing from approximately 4% of global GDP in 2019 to 2% in both 2020 and 2021, and rising slightly to 2.5% in 2022. The total loss for the three years has reached 4.2 trillion US dollars. (UNWTO, 2023:12).

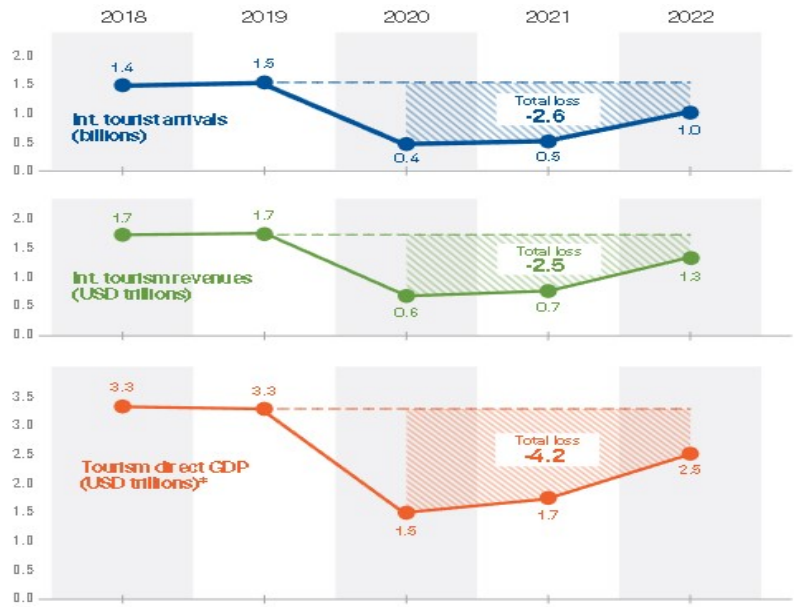
Figure 2: World's Top 10 Destinations International Tourist Arrivals (Millions)



Source: (UNWTO,2023)

When figure 2 is analyzed prior to the pandemic, destinations that were at the peak of tourism experienced varying performances during the pandemic due to implemented restrictions and health measures. Some countries adopted stricter travel restrictions and quarantine measures, while others embraced more flexible policies and developed strategies to revitalize tourism. These different approaches have led to significant changes in tourist arrivals. It can be said that the prominent destinations in the post-pandemic period have relied significantly on their natural brand strength and resilience. Destinations that have gained the trust of tourists and portrayed a positive image in terms of health safety have recovered more rapidly and experienced a resurgence in tourism. In this context, the destinations that showed the best performance in terms of international tourist arrivals in 2022 significantly differed from the rankings in the pre-pandemic period. It can be said that the priorities of travelers and the health safety policies of destinations played an important role in shaping these new rankings.

Figure 3: International Tourist Arrivals, Tourism Revenues and Tourism Direct GDP



Source: (UNWTO October 2023)

When the values in Figure 3 are analyzed, it can be observed that international tourist arrivals declined from 1.5 billion people in 2019 to 0.4 billion in 2020, increased slightly to 0.5 billion in 2021 and further increased to 1.0 billion in 2022. The total loss in the number of people participating in tourism activities for the years 2020, 2021 and 2022 was 2.6 billion people. Similarly, international tourism revenues showed a significant decline, decreasing from 1.7 trillion USD in 2019 to 0.6 trillion USD in 2020, slightly increasing to 0.7 trillion USD in 2021 and further increasing to 1.3 trillion USD in 2022. The total loss in tourism revenues for the three years totaled USD 2.5 trillion. The direct contribution of tourism to global GDP was 3.3 trillion USD in both 2018 and 2019. However, this figure decreased to 1.5 trillion USD in 2020 and slightly increased to 1.7 trillion USD in 2021. Subsequently, the direct contribution of tourism to GDP recovered, reaching 2.5 trillion USD in 2022. The total loss in the direct contribution of tourism to GDP for the years 2020, 2021and 2022 was 4.2 trillion USD.

Figure 4: International Tourist Arrivals (% Change Over 2019**)**

Source. (UNWTO October 2023)

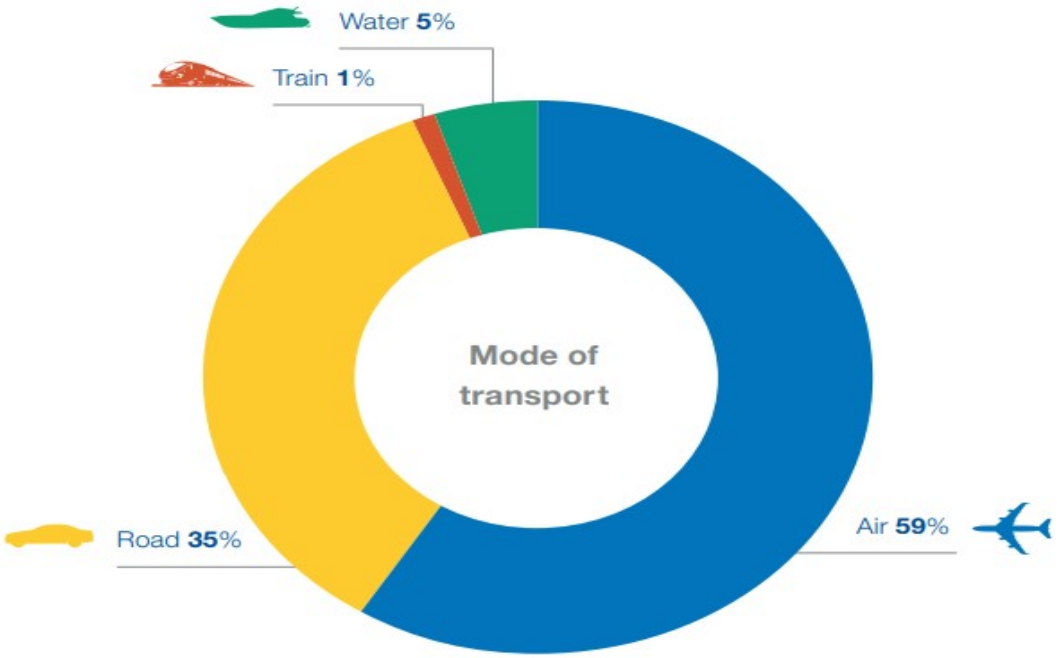
When Figure 4 is analyzed, all regions experienced large decreases in arrivals in 2020. Asia and the Pacific, being the region initially affected by the pandemic and subjected to the most stringent travel restrictions, experienced the largest relative decline in international arrivals, with an 84% decrease in 2020. In Europe and the Americas, there was a 68% decrease in international tourist arrivals in 2020. On the other hand, the Middle East and the African continent experienced a 73% decrease in international arrivals. In 2021, despite remaining below 60% of 2019 levels, the Middle East and Europe emerged as the best-performing regions in terms of recovery compared to 2020.

3. Tourism and Transport: Pandemic Impact on Global Travel

The end of World War II led to the rapid evolution of international civil aviation. During this period, air transportation began to encompass intercontinental flights. Notably, the factors of speed and time enabled air travel to surpass sea and land transportation, making it the preferred choice. Even for short and medium-distance journeys, airplanes have become an indispensable means of travel for people. This has led to a revolutionary change in the transportation sector, making air travel a defining element in the global travel industry (Arıkan, 1998:47).

It is crucial to emphasize the strong, mutual, and symbiotic relationship between tourism and aviation. Commercial air transportation, including regular passenger traffic and chartered air services, is a significant parameter for global and regional tourist flows. In the tourism sector, the share of air travel increased from 46% in 2000 to 59% in 2019, while land transportation decreased from 49% to 35% over the same period (UNWTO, November 2020:10).

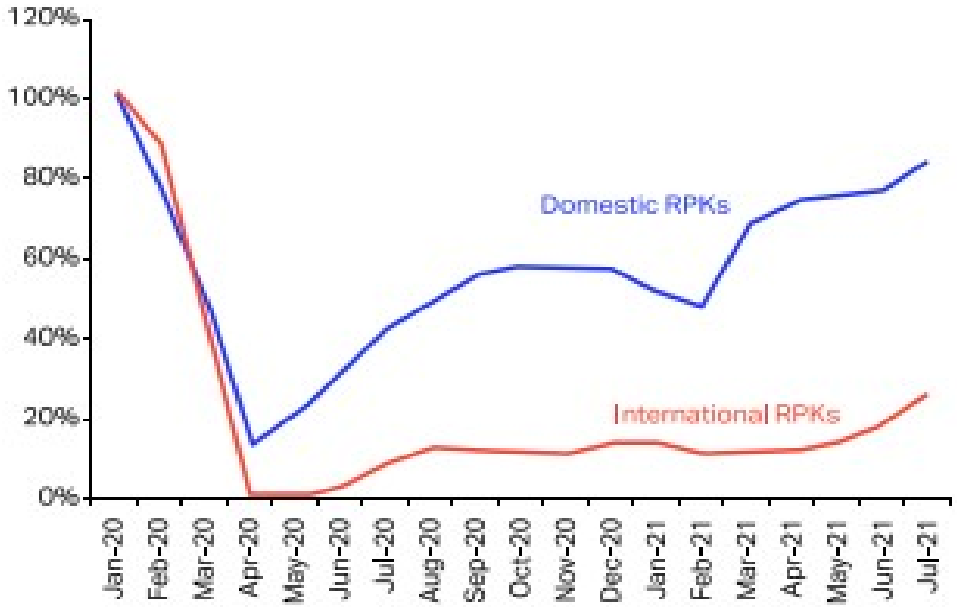
Figure 5: Inbound Tourism by Mode of Transport, 2019 (% Share)



Source: (UNWTO, November 2020)

Figure 5 shows that air transportation is the most important mode of transport in the tourism sector. It can be said that the most significant factors in the preference for air travel in the tourism industry are time and comfort. Reaching long distances in a short time makes airline transport important in the sector. Given that air transportation constitutes 59% of travel in the tourism sector, road transportation 35%, and sea and rail transportation together only 6%, it can be asserted that disruptions in air travel have a substantial impact on the tourism industry.

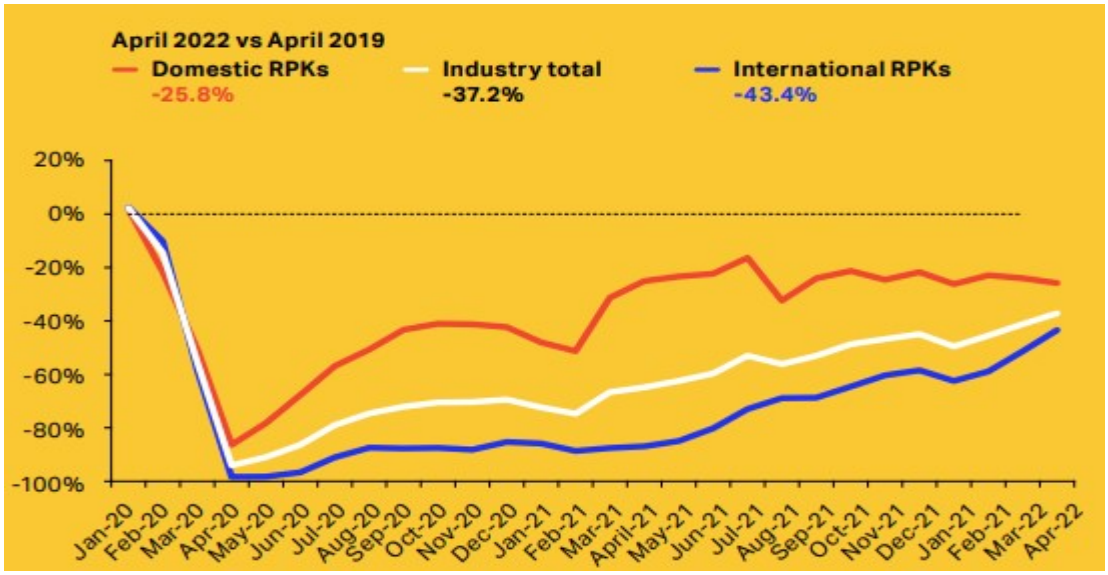
Figure 6: Real Passenger Traffic % Of 2019 Levels



Source: (IATA Annual Review 2021:10)

International air traffic began to recover in 2021 after hitting a dip point in April 2020 due to COVID-19. Following the initial impact of the pandemic, international air travel was adversely affected by travel restrictions for most of 2020 and early 2021. Figure 6 illustrates a robust demand for domestic air travel from April 2020 to October. Following a decline in air passenger traffic in the first quarter of 2021 due to new virus outbreaks, there has been a rising trend, particularly in domestic routes, after February 2021.

Figure 7: Percentage Change in Real Passenger Traffics (RPKS)



Source: (IATA Annual Review 2021:10)

Figure 7 shows that since April 2020, the relaxation of government border policies worldwide has led to growth in international air passenger traffic in 2021 and 2022. Airline passenger transportation, which showed a rapid recovery trend in the first and second quarters of 2020, experienced a fluctuating trend in 2021 with the emergence of new viruses.

4. Review of Literature

The Covid-19 pandemic has adversely affected the tourism and transportation sectors on a global scale. Academic studies conducted in different countries have revealed varying results depending on the methods used and the characteristics of the variables. The table below summarizes selected studies on these sectors in Türkiye and other countries

Table 4. Literature Studies Related to the Subject

Author or Authors	Period	Method	Findings
Altun and Dinçer (2020)	3 March to 9 April 2022	Content Analysis Method	It was revealed that tourist guides could not make economic gains in the first six months of the pandemic and had to work under low wages during the pandemic period.
Arısoy and Bağcı (2024)	August to September 2022	Content Analysis Method	In the study, it was concluded that the workload and the need for skilled labour

			increased in the tourism sector during the Covid-19 period; the flexible working model caused communication problems among employees, on the other hand, it reduced costs for firms.
Ghosh (2020)	1996Q1 to 2020Q1	NARDL Model	It has been determined that economic policy uncertainties that arise during pandemic periods affect the number of tourists coming to the country asymmetrically.
Gümüş and Hacıevliyagil (2020)	2 March 2020 and 17 July 2020	ARDL (Autoregressive Distribution) Sınır Testi	In the study, no significant relationship was found between the number of Covid 19 cases and the index series.
Khan et al (2021)	2018 to 2021	Descriptive Analysis	it was determined that economic growth, global trade, health sector, unemployment and underemployment, foreign direct investment, and travel and tourism sector were significantly affected by COVID-19.
Korkut et al (2020)	11 March to 2 July 2020	ARDL (Autoregressive Distribution) Boundary Test	They have found that Covid-19 negatively impacted the BIST Tourism Index in the short term.
Korınth and Ranasınghe. (2020)	March 2019 to March 2020	Second Data and Descriptive Analysis	The study found that due to the spread of COVID-19 and the small number of air connections, Poland experienced a significant decrease in tourist movements in March 2020,
Özcan (2021)	2019 Q1 to 2020Q3	Data Envelopment Analysis (DEA) and Tobin's Q ratio	Tobin q ratio analysis revealed that Covid-19 negatively affected the transport and tourism sectors.
Özdemir (2020)	12 March 2020 to 31 August 2020	Hatemi-J Asymmetric Causality Test	It has been determined that increases (decreases) in Covid-19 case numbers have had both positive and negative effects on the service index in different periods
Öztürk et al (2020)	2 January 2020 to 15 April 2020	Fixed-Effects Model	Sectoral indices were found to be more affected by the number of cases in Türkiye than the number of cases in Europe and the world.

Purba et al (2021)	2018 to2020	Regression Equation Model	They have determined that the Covid-19 pandemic has negatively impacted Indonesian tourism and has had adverse effects on Indonesia's GDP.
Şengel et al (2020)	March 5–12, 2020 and April 5–12, 2020	Content Analysis	In both research periods, they have identified a strong relationship between COVID-19-related news and the tourism and travel industry
Shih-Shuo Yeh (2021	March 2020	Qualitative Research Method	The study concluded that open communication is crucial for successfully combating the pandemic, while government-backed loans are crucial for the survival of the tourism sector.
Skare et al (2021)	1995 to 2019	PSVAR Auto-Regression Model and System Dynamics Modeling	Researchers have forecasted that COVID-19 will have much more devastating impact on the travel and tourism industry than previously anticipated.
.Szczygielski, et al (2021)	1 January 2019 to 19 June 2020	ARCH/GARCH Model	It is determined that the effect of uncertainty about COVID-19 varies across time and regions, moves in parallel with alternative uncertainty measures such as VIX and TMU indices.
Taşdelen et al. (2022)	2010-2022	Situation Analysis	The study found that during the pandemic in Türkiye, while freight rates consistently decreased, export and import values continuously increased.
Tayar et al (2020)	17 March 2020 to 28 April 2020	Simple Linear Regression Analysis	Covid-19 has a significant and negative impact on electricity, transport, financial, industrial and technology indices in Türkiye
Temir .C (2020)	2 January .2020 to 14 May .2020	Secondary Data Analysis	Covid-19 caused negative recessions in capital markets depending on the duration of the pandemic.
Uddin et al. (2020)	1 July 2019 to 14 August 2020	Dynamic Panel-Based EGARCH (1,1) Model	It has been determined that country-level economic characteristics and factors help mitigate

			the volatility caused by the virus outbreak.
Uğur and Akbıyık (2020)	30 December 2019 to 15 March 2020	Text Mining Techniques	They concluded that the spread of negative news and tourists' cancellation decisions are simultaneous and therefore the tourism sector is easily affected by global crises.
Ulak (2020)	3 July 2020 to 30 July, 2020	Qualitative Research Technique	It found that health-related services, PCR testing facilities, quarantines and isolation wards were inadequate in Nepal during the pandemic.
Zeren and Hızarcı (2020)	23 January 2020 to 13 March 2020	Maki Cointegration Test	In the study, it is found that the total number of deaths and all stock markets are cointegrated in the long run.
Zhang et al (2020)	30 January to 27 March 2020	Volatility Analysis Correlation Analysis	They have found that the risks in global financial markets have significantly increased due to the pandemic, that stock market reactions in each country vary according to the severity of the outbreak, and that the substantial uncertainty and economic losses caused by the pandemic have made the markets extremely volatile and unpredictable.

5. Data Set and Methodology

The study investigates the financial performance of the transportation and tourism sectors, which are among the industries most affected by Covid-19 during the pandemic period. The study utilizes daily data on COVID-19 daily case numbers, as well as the BIST tourism and transportation indexes, spanning from March 15, 2020, to May 31, 2022. The data for the variables were obtained from the Turkish Ministry of Health and Investing.com databases. In the study, the logarithmic values of the time series data for COVID-19, tourism, and transportation sectors were used to detect the asymmetric variance effect among them using the EGARCH model, which is one of the asymmetric GARCH models. The study employed the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to ascertain the unit roots of the variables. Additionally, the variance causality test proposed by Hafner and Herwartz was utilized to analyze the variance relationship. The EGARCH model was preferred for determining asymmetric volatility relationships. The analyses were conducted by using the Eviews 10 software package. The EGARCH model was preferred for identifying asymmetric volatility relationships among variables. The analyses were conducted by using the Eviews 10 software package.

Table 5: Variables Used in The Study

Symbol	Explanations of Abbreviations	Analysis Period	Data Source
COVİD 19	Coronavirus Pandemic	15 March .2020 – 31 May 2022	TC Health Minister
XULAS	BIST Transport Index	15 March .2020 – 31 May 2022	Investing.com
XTRZM	BIST Tourism Index	15 March .2020 – 31 May 2022	Investing.com

The null and alternative hypotheses for the study are formulated as follows:
H0: There is no significant asymmetric volatility effect of COVID-19 on the BIST tourism and transportation indexes in Türkiye
H1: There is a significant asymmetric volatility effect of COVID-19 on the BIST tourism and transportation indexes in Türkiye

5.1. Causality Test

In the study, a causality relationship between COVID-19 and the Tourism and Transportation sectors was tested by using the Hafner and Herwartz variance causality test, based on daily logarithmic data of the variables.

5.1.1. Hafner and Herwatz Test for Causality in Variance

Hafner and Herwartz (2006) variance causality test offers a simple testing technique based on the Lagrange Multiplier (LM) principle, which can be smoothly applied even in small samples. In the variance causality test by Hafner and Herwatz, the null hypothesis that there is no variance causality is tested by using the Lagrange Multiplier (LM) statistic based on a univariate GARCH model.

$$\varepsilon_{it} = \varepsilon_{it}\sqrt{\sigma_{it}^2}\, g_t,\ g_t = 1 + z_{jt}^{1}\pi,\ z_{jt} = (\varepsilon_{t-1}^2, \sigma_{t-1}^2) \quad (1)$$

In the equation σ_{it}^2 represents the conditional variances and $\sigma_{it}^2 = \omega_i + \alpha_i\varepsilon_{t-1}^2 + \beta_i\sigma_{t-1}^2$ dir. ε_{it} = represents the standardized residuals from the GARCH model. If π=0 in the equation, the hypothesis H0 which states that there is no causality in variance, is accepted (Şenol and Turkay, 2020:373).
in this study before the Hafner and Herwatz variance causality test used, the stationarity of the time series was analyzed. For this purpose, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, which are among the most widely used unit root tests in the literature, have been applied in both fixed and fixed and trended models. Hafner and Herwatz variance causality test results are evaluated at 5% significance level.

5.2. Inter-Variable Return and Volatility Analysis

In the study, the EGARCH (Exponential Generalized Autoregressive Conditional Heteroskedasticity) model, developed by Bollerslev, was utilized to identify the asymmetric volatility effect between COVID-19 and the tourism and transportation sectors.

5.2.1. EGARCH Model

The EGARCH (p,q) model, an enhanced version of the GARCH model known as Exponential GARCH, utilizes the natural logarithm of the dependent variable, which yields positive values. Additionally, the EGARCH model allows for capturing the asymmetric effects of positive and negative market news on variance. The Exponential GARCH (EGARCH) model enables the testing of asymmetries in financial markets. This model utilizes the logarithmic values of variance series to capture the leverage effect of negative and positive shocks that arise in financial markets for various reasons. EGARCH (p,q) models can be expressed as follows:

$$\text{Log}\,(\sigma_t^2) = \alpha_0 + \sum_{i=1}^{q}\alpha_i\left[\left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right|\right] + \sum_{i=1}^{p}\beta_i \log\,(\sigma_{t-i}^2) + \sum_{i=1}^{q}\gamma_i\frac{\varepsilon_{t-i}}{\sigma_{t-i}} \quad (2)$$

γ_i= asymmetric or leverage effect parameter. Even if this parameter is negative, the conditional variance value will be positive because it estimates the logarithmic values of the conditional variance. If the relationship between current return and future volatility is negative, γ will be negative and therefore the leverage effect will remain limited (Uçar & Alsu, 2023:100)

5.3. Time Series Graphs of Variables

This section presents the graphs related to the variables used in the study. The trends in daily price changes of the tested parameters are analyzed through the graphs.

Figure 8: The Trends in Daily Price Changes in Covid 19

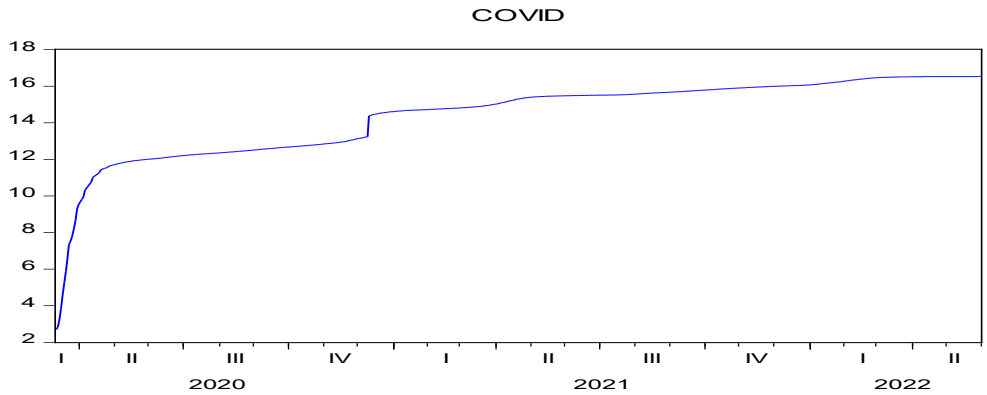


Figure 9: The Trends in Daily Price Changes in XTRZM**.**

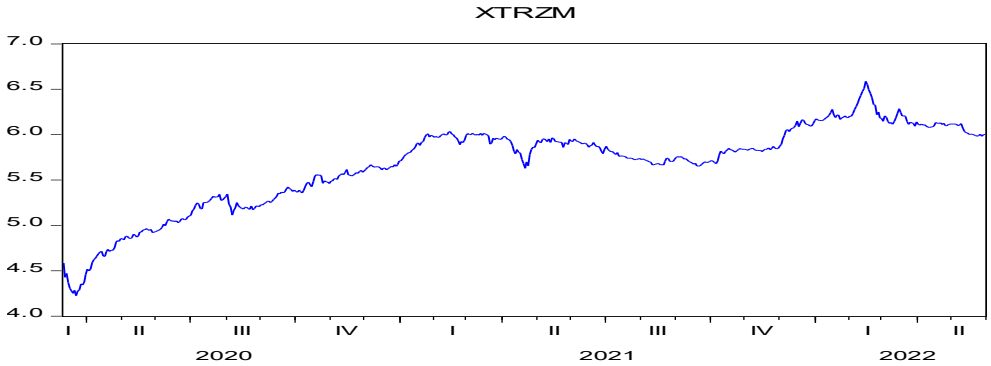
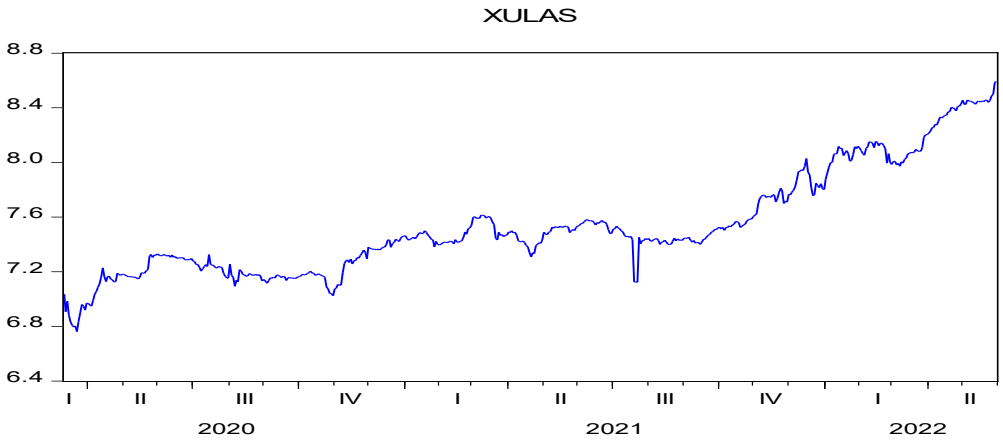


Figure 10: The Trends in Daily Price Changes in XULAS**.**



When the time series graph of the variables is analysed, it can be said that Covid, XTRZM and XULAS indices generally follow a similar movement even if they are in different trends in some periods. There was a rapid increase in daily Covid case numbers in the first half of 2020, followed by a decrease in the rate of new cases in the subsequent period. The XTRZM and XULAS indices experienced a sharp decline in the first quarter of 2020 due to COVID-19 but subsequently recovered and started to rise. In the most recent period, it can be observed that the XTRZM index is trending downward, while the XULAS index is on an upward trend.

5.4. Correlation Matrix Results Between Variables

The correlation coefficients between the variables used in this study are presented in Table 6 below.

Table 6: Correlation Matrix Results Between Variables

	COVID	XTRZM	XULAS
COVID	1		
XTRZM	0.91025713	1	
XULAS	0.75549006	0.77693845	1

In Table 6, examining the correlation between the daily logarithmic time series of Covid cases and the XTRZM and XULAS indices reveals positive correlations of 0.91 and 0.75, respectively. This indicates a significant interaction between the increase in daily Covid case numbers and these indices.

5.5. Descriptive Statistics of the Variables

Before modeling the variables addressed in the study, descriptive statistics were calculated to understand the general characteristics of the series. The results obtained are shown below in Table 7.

Table 7: Descriptive Statistics of COVID Daily Cases and XTRZM and XULAS Indices

	COVID	XTRZM	XULAS
Mean	14.37120	5.666384	7.532621
Median	15.30063	5.790541	7.443532
Maximum	16.52840	6.588225	8.591542
Minimum	2.708050	4.225373	6.762279
Std Deviation	2.174035	0.462414	0.381402
Skewness	-1.826597	-0.963345	0.871662
Kurtosis	8.363821	3.476074	3.092926
Jarque Bera	1017.813	95.18714	73.65557
(Probability)	(0.000000)	(0.000000)	(0.000000)
Observation	580	580	580

When Table 7 is analysed, it is seen that the index performances measured by average return are higher in the Borsa Istanbul transport index (XULAS). On the other hand, the average return, i.e. the performance of the Borsa Istanbul tourism index is lower than the Borsa Istanbul transport index. In addition, Borsa İstanbul tourism index (XTRZM) has a higher volatility than the transport index (XULAS) with a standard deviation value of 0.46. When the probability values of Jarque-Bera statistics are less than 0.05, it means that the time series of the variables are not normally distributed. In other words, this indicates that the null hypothesis is rejected for all cases. The skewness of Borsa Istanbul transport index (XULAS) was found to be to the right with a value of 0.87, while the skewness of Borsa Istanbul tourism index (XTRZM) was found to be to the left with a value of -0.96. In addition, the kurtosis coefficient was found to be quite high in the Covid daily number of cases variable.

6. Empirical Findings

This section presents the findings obtained from the unit root, causality, return and volatility tests for the variables used in the study.

6.1.Unit Root Test Results

In this section, unit root test hypotheses and results obtained for the variables are presented. In the study, the stationarity of the series are analysed by Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests. The hypotheses for the unit root tests are as follows:

H0: The time series contains unit root.

H1: The time series does not contain unit root

Table 8: Augmented Dickey-Fuller (ADF) And Phillip-Perron (PP) Unit Root Test Results

Phillip Perron (PP) Unit Root Test Results								
	At Level				**At First Difference**			
Variables	**With Constant**		**With Constant & Trend**		**With Constant**		**With Con stant& Trend**	
	t-Statistic	**Prob.**	**t-Statist**	**Prob**	**t-Statis**	**Prob**	**t-Statist**	**Prob**
COVID	-7.3125	0.0000	-11.5863	0.0000	-12.8131	0.0000	-13.824	0.0000
XTRZM	-2.2808	0.1786	-1.8532	0.6773	-22.8891	0.0000	-22.978	0.0000
XULAS	0.5172	0.9872	-1.5311	0.8180	-25.0361	0.0000	-25.059	0.0000
Augmented Dickey Fuller (ADF) Unit Root Test Results								
	At Level				**At First Difference**			
Variables	**With Constant**		**With Constant & Trend**		**With Constant**		**With Constant & Trend**	
	t-Statistic	**Prob**	**t-Statist**	**Prob**	**t-Statist**	**Prob**	**t-Statist**	**Prob**

COVID	-1.4196	0.5735	-2.6898	0.2412	-9.4496	0.0000	-9.2398	0.0000
XTRZM	-3.0007	0.0354	2.1467	0.5180	-22.6892	0.0000	-22.869	0.0000
XULAS	0.4414	0.9845	-1.1103	0.9252	-16.0753	0.0000	16.1103	0.0000

When Table 8 is analysed, it is determined that the Borsa Istanbul tourism index (XTRZM) is stationary at 5% significance level according to the Augmented Dickey-Fuller (ADF) unit root test in the model with constant. In the Phillips-Perron (PP) unit root test, it has been determined that the COVID variable is stationary at the 1% significance level in both the constant and constant-trend models. It has been found that all-time series become stationary at the 1% significance level when first-order differences of the time series are taken, indicating clarify for the tests.

6.2. Results of the Hafner-Herwatz Variance Causality Test

In this section of the study, the causality relationship between Covid and the Borsa Istanbul tourism and transportation indices has been examined using the Hafner-Herwatz Variance Causality Test. Before conducting the Hafner-Herwatz causality analysis, the unit roots of the series were examined using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests in both the constant and constant-trend models. The results of the Hafner-Herwatz test have been evaluated at the 5% significance level.

Table 9: Hafner-Herwatz Variance Causality Test Results

Variables	Hypothesis	Test Statistic	Probability	Causality
COVID XTRZM XULAS	COVID→XTRZM	0.763	0.6928	**NO**
	XTRZM→COVID	0.415	0.8127	
	COVID→XULAS	0.741	0.6905	
	XULAS→COVID	0.211	0.8998	

As observed in table 9, statistically significant causality between Covid and the Borsa Istanbul tourism and transportation indices could not be detected.

6.3. EGARCH Model Results

In this section of the study, the test results obtained from the EGARCH model applied to detect the volatility interaction between Covid and Borsa Istanbul tourism and transportation indices are presented in Tables 10 and 11 below**.**

Table 10: Volatility Interaction Between Covid And Tourism Index EGARCH Model Estimation Results

Mean Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob**
COVID	0.021576	0.022085	0.976956	0.3286
C	0.001702	0.001032	1.649600	0.0990
Variance Equation				
φ	-1.034300	0.204196	-5.065235	0.0000
θ	0.375806	0.060304	6.231883	0.0000
λ	0.028066	0.034095	0.823186	0.4104
β	0.899823	0.024573	36.61867	0.0000
Diagnostic Tests				
Heteroskedasticity Test: ARCH		**Normality Test**		
F-statistic	**Probability**	**Jarque-Bera**	**Probability**	
0.000847	0.9768	67.98359	0.000000	

Table 11: Volatility Interaction Between Covid and Transportation Index EGARCH Model Estimation Results

Mean Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob**
COVID	0.119869	0.001058	113.2707	0.0000
C	5.665819	0.015075	375.8367	0.0000
Variance Equation				
φ	-1.345246	0.212010	-6.345186	0.0000

θ	1.049294	0.122283	8.580838	0.0000
λ	0.064643	0.075346	0.857947	0.3909
β	0.917261	0.028784	31.86687	0.0000
Diagnostic Tests				
Heteroskedasticity Test: ARCH		**Normality Test**		
F-statistic	**Probability**	**Jarque-Bera**	**Probability**	
0.660987	0.4165	98.20565	0.000000	

Note: φ = denotes the constant term. θ= ARCH effect of the dependent variable. λ= Asymmetric effect; shows the effect of positive and negative news on the volatility of the dependent variable β= GARCH effect, i.e. the volatility of the dependent variable.

When Tables 10 and 11 are analysed together, according to the results of the mean equation explaining the return interaction between variables, it is determined that there is no statistically significant relationship between Borsa Istanbul tourism and transportation indices and Covid-19 daily number of cases. This shows that there is no interaction between the number of Covid-19 daily cases and Borsa Istanbul tourism and transportation indices.

In the variance equation extracted from the EGARCH model, the statistical values of ARCH and GARCH parameters indicating the volatility of Borsa Istanbul tourism and transportation indices are significant and positive, indicating that the ARCH effect is modelled. The p-value of the ARCH effect is less than 0.05 and the coefficient is positive indicates that the Covid daily total number of cases is effective on the volatility of Borsa Istanbul tourism and transportation indices. When the sign of the asymmetric risk term λ is analysed, the fact that this term is not statistically significant indicates that the volatility on Borsa Istanbul tourism and transportation indices does not have an asymmetric structure. In other words. the insignificance of the asymmetrical risk term λ suggests that the volatility of the Borsa Istanbul tourism and transportation indices does not exhibit asymmetry. Therefore, as the asymmetric risk term λ is not significant in the model, it can be said that positive or negative news about Covid daily case numbers do not affect the volatility of Borsa Istanbul tourism and transportation indices. Besides the high sum of the ARCH and GARCH coefficients, which provide insights into the intensity and persistence of volatility transmission in the Borsa Istanbul tourism and transportation indices, can be interpreted as indicating that volatility and volatility shocks are highly persistent. When the Jarque Bera test results are analysed, the probability value being less than 0.05 indicates that the series are not normally distributed and the null hypothesis is rejected. The probability values of the ARCH LM test statistic, which tests for the presence of ARCH effect in the residuals of the mean equation, are greater than 0.05 in the model, indicating that there is no ARCH effect in the residuals.

7. Conclusion

The Covid-19 pandemic is recognized as one of the most important pandemics of the last century and has led to a global recession and decline, affecting all sectors in different ways. The pandemic has profoundly affected society and the financial system, leading to significant changes in consumer habits, global travel preferences and destination choices. During the pandemic period, accommodation and travel businesses operating in the tourism sector were subjected to significant functional changes. All these changes have caused problems in the tourism and transportation sectors. In this context, the study investigates the financial performance of the transport and tourism sectors, which are among the sectors most affected by Covid-19 during the pandemic in Türkiye. In the study, EGARCH model is used to determine the return and volatility spillovers between Covid and Borsa Istanbul tourism and transport indices. Events that affect equity markets positively and negatively lead to asymmetric effects on stock returns. For this reason, the EGARCH model, one of the asymmetric GARCH models, is used in this study because this model allows us to detect the asymmetric effect on market volatility caused by positive and negative news. In addition, Hafner and Herwartz variance causality test was used to investigate the causality between variables. Hafner and Herwatz variance causality test did not find a statistically significant causality between the variables. According to the results of the conditional variance equation obtained from the EGARCH model, since the ARCH and GARCH coefficients indicating the volatility of Borsa Istanbul tourism and

transport indices are positive and significant in the models, it is determined that there is a volatility spillover from Covid variable to tourism and transport indices. The statistically insignificant result of the asymmetric risk coefficient λ indicates that the volatility interaction on the Borsa Istanbul tourism and transportation indices is not asymmetric. It has been determined that positive and negative shocks do not have any impact on the volatility of these indices. Additionally, the high sum of the ARCH and GARCH coefficients, which provide insights into the intensity and persistence of volatility spillover on the Borsa Istanbul tourism and transportation indices, suggests that the volatility and its persistence may be long-lasting. It is believed that the findings from this study will aid students, service sector entrepreneurs, academic and policy makers to better understand the relationship between pandemic diseases and the service sector and to develop economic policies accordingly.

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