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First Period Effect of Covid-19 on International Aviation Tourism

Ferhat PEHLİVANOĞLU*
Murat EMİKÖNEL**
Muhammet Rıdvan İNCE***

Abstract

The rapid spread of the coronavirus pandemic on a global scale has led to international travel restrictions and significantly affected the aviation and tourism sectors, leading to job losses. Considering this situation, this study examines the change in international air transportation and tourism sectors during the pandemic period and constructs a threshold autoregressive (TAR) model based on data from 38 countries. According to the findings of the study, the number of coronavirus cases is statistically significant in regimes 2, 3 and 4, and when the number of coronavirus cases increases by one unit, the number of flights in these regimes increases by 0.03, 0.01 and 0.02 units, respectively. The number of coronavirus deaths is statistically significant in regimes 2, 4 and 5, and when the number of coronavirus deaths increases by one unit, the number of flights in these regimes decreases by 1.26, 2.20 and 2.52 units, respectively.

Keywords: Coronavirus, Tourism, Economic Crisis, Aviation.

Article Type: Research Article

Uluslararası Havacılık Turizminde Covid-19 İlk Dönem Etkisi

Öz

Koronavirüs salgınının küresel ölçekte çok hızlı bir şekilde yayılması uluslararası seyahat kısıtlamalarını beraberinde getirmiş ve havacılık ve turizm sektörlerini önemli ölçüde etkileyerek iş kayıplarına yol açmıştır. Bu durum göz önünde bulundurularak, çalışmada, pandemi döneminde uluslararası hava taşımacılığındaki ve turizm sektöründeki değişim incelenmiş olup 38 ülke verisi kapsamında eşik otoregresif (TAR) modeli kurulmuştur. Çalışmadan elde edilen bulgulara göre, koronavirüs vaka sayısı 2., 3. ve 4. rejimlerde istatistiksel olarak anlamlı olup, koronavirüs vaka sayısı bir birim arttığında bu rejimlerde uçuş sayısı sırasıyla 0,03, 0,01 ve 0,02 birim artmaktadır. Koronavirüs ölüm sayısı 2., 4. ve 5. rejimlerde istatistiksel olarak anlamlıdır ve koronavirüs ölüm sayısı bir birim arttığında, bu rejimlerde uçuş sayıları sırasıyla 1,26, 2,20 ve 2,52 birim azalmaktadır.

Anahtar Kelimler: Koronavirüs, Turizm, Ekonomik Kriz, Havacılık.

Makale Türü: Araştırma Makalesi

* Prof. Dr., Kocaeli University, Faculty of Political Sciences, Department of Economics, fpehlivanoglu@kocaeli.edu.tr, ORCID iD: 0000-0001-6930-0181
** Research Assistant, Kocaeli University, Faculty of Political Sciences, Department of Economics, murat.emikonel@kocaeli.edu.tr, ORCID iD: 0000-0002-8415-0510
*** Research Assistant, Kocaeli University, Faculty of Political Sciences, Department of Economics, muhammet.ince@kocaeli.edu.tr, ORCID iD: 0000-0003-2050-2545

1. INTRODUCTION

Coronaviruses (CoV) come from a family of viruses that can be seen as common and mild infections such as the common cold, but with serious effects such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The coronavirus, which first appeared in November 2002, in a previously unknown way, was named SARS-CoV in February 2003. In this process, according to the data of the World Health Organization, the virus infected 8.098 people and caused 774 people to die. Then, in 2012, a type of coronavirus called MERS emerged. This virus has caused the death of about 35% of the infected people and according to the data of the World Health Organization, 858 people have died so far (WHO). Another type of coronavirus is the virus, which was first seen in the People's Republic of China in December 2019 and named as Covid-19 in February 2020. Despite the fact that one year has passed since the first appearance of the virus, since the virus spread rapidly, could not be noticed at first and could not be predicted to cause such a health problem, the virus infected 90.142.202 people as of January 10, 2021 and caused 1.936.026 people to die. As a result of the rapid spread of the virus in a short time, the whole world has been affected by health, economic and social aspects.

With the outbreak of the virus in 114 countries in March, the World Health Organization declared a state of epidemic on March 11, 2020. In this process, although the epidemic is seen as a problem related to social life and the health system, measures such as curfews, travel bans, closure of certain sectors for a while to reduce and control the spread of the virus; The slowdown in production has led to economic problems such as losses in national and international business life, disruption of the supply chain, significant slowdown in cash flow and income growth (Haleem, Javaid and Vaishya, 2020:1). Despite the measures, the restrictions continued as a result of the lack of a definitive treatment method to eliminate the damage caused by the virus in the human body and insufficient health services such as necessary health personnel, drugs, intensive care unit, respirator, and medical supplies. Especially with the effective use of measures restricting human mobility to prevent the spread, international air travel has slowed down rapidly and many countries have imposed travel bans, closed their borders and applied quarantine, and both international and domestic tourism have declined sharply.

Previous studies examining the impact of the pandemic on the aviation industry have generally focused on issues such as passenger behavior, travel restrictions and government policies. Very few studies have examined the relationship between the number of cases and number of air passengers. However, no study has examined the impact of both the number of cases and the number of deaths on number of passengers. On the other hand, increases and decreases in the number of cases and deaths during pandemic periods are non-linear. In other words, different periods show different characteristics. Therefore, these effects need to be separated from each other. In this context, it is aimed to fill the gap in the existing literature by analyzing the simultaneous effect of the number of cases and deaths on number of air passengers for different periods. Accordingly, in the following sections of the study, the effects of coronavirus on tourism and aviation industry are evaluated (Section 2), and an extensive literature review on the subject is conducted (Section 3). In the following sections, analysis and results are given.

2. IMPACT OF CORONAVIRUS ON TOURISM AND AVIATION INDUSTRY

The measures taken to reduce and control the spread of the coronavirus brought about economic problems. In this process, some factors such as individual economic welfare, disposable income, changes in costs affect consumer behavior and travel demand (Lee and Chen, 2011: 1421-1422). After the beginning of February 2020, more than fifty airlines suspended or limited flights to many countries, including China, Italy, Australia, Russia and the USA. In addition, governments have imposed travel restrictions in this process (Chinazzi et al., 2020). International travel bans and restrictions on community mobility affected more than 90% of the world's population and thus tourism mobility was greatly slowed down in March 2020 (Gössling et al., 2020:1). Travel and tourism has been one of the sectors where people cut their spending the most, especially due to significant restrictions such as social distance and mobility (McKinsey & Company, 2020). In the early period when the effects of the Covid-19 epidemic were felt, the World Travel and Tourism Council stated that 50 million workers could be laid off in the travel and tourism industry worldwide, and said that Asian countries could be the most

affected countries. Layoffs and bankruptcy reports were first seen when the British airline FlyBe declared bankruptcy on March 5, 2020, as a result of the economic problems experienced (Business Insider, 2020). It has been stated that even when the epidemic ends, the recovery of the sector may take ten months (World Economic Forum, 2020). This effect, depending on how long the epidemic will last, has created an effect that is likely to be exacerbated by the restrictive measures taken by the US administration on travel to Europe (World Travel and Tourism Council, 2020). As of April 27, 2020, according to the data of the United Nations World Tourism Organization (UNWTO), international tourism has been completely stopped in 156 (72%) of all destinations around the world. 83% of destinations in Europe, 80% in the Americas, 70% in Asia and the Pacific, 62% in the Middle East and 57% in Africa have completely closed their borders for international tourism. In this process, a loss of 80 billion dollars was experienced in tourism revenues (www.unwto.org). According to the CEO of WTTC, it was estimated that the epidemic had such a significant impact that it could reduce the travel industry by 25% in 2020 (BBC, 2020b).

Passenger mobility at airports worldwide decreased by 12% in the first quarter of 2020 (ACI, 2020a). The decrease in the number of passengers, especially in the Asia-Pacific region, was remarkable. Air transport passenger revenues around the world, especially in the Far East-Asia regions, decreased by 20% in this period. In March, the International Air Transport Association estimated that global airline revenue would decrease by $29.3 billion to $113 billion in 2020, as the coronavirus caused a contraction in global air demand (IATA, 2020). However, as of the end of 2020, there was a loss of 1 trillion dollars in the sector and a 74 percent decrease in demand compared to 2019. Therefore, the international air transport and tourism sector has been one of the sectors where the negative effects of the global crisis were experienced the most during the epidemic process. In order to minimize these negative effects of the pandemic on the aviation and tourism sectors, these two sectors were supported with various support and loan packages (Hale et al., 2020. p.3). Despite all these measures, the epidemic period was difficult for countries where the aviation and tourism sector has an important place in the country's income. With the spread of the virus despite all precautions, almost all parts of the accommodation value chain have been affected. The impact of canceled reservations, closures of accommodation and closures of central locations was also quickly felt in other parts of the supply chain, such as catering and laundry services. Although restaurants are closed for a certain period of time as part of the measures, they are allowed to continue their activities with the transition to package/delivery sales in some countries. With the relaxation of the restrictions with the summer months, a period called the new normal, in which mask, distance and personal hygiene come to the fore, has been entered. With this normalization, certain touristic businesses and destinations have started to serve (Nicola et al., 2020). It has been revealed that perceived health risks and fear are the major causes of changes in people's behavior (Witte and Allen, 2000; Van Bavel et al., 2020:6). For this reason, although the uncertainty and panic environment caused by the pandemic had a reducing effect on consumer behavior and travel demand at first, some improvement was achieved in tourism and travel, especially in the summer months, with the removal of uncertainty and panic environment over time. In this process, it is expected that the demand for rural areas with low human density will increase due to the sensitivity of physical distance, rather than taking a vacation in big cities where the population density is high (Ranasinghe et al., 2020: 12). In line with this expectation, people who made a holiday preference according to their social status before the pandemic started to prefer different types of accommodation such as boutique hotels, hotel with room concept, apart hotel, caravan or rental housing. While such unexpected sharp changes in market perceptions satisfy some of the stakeholders of the tourism sector, they may adversely affect some stakeholders due to the lack of capacity and cause significant economic problems. (Beirman, 2003: 3-4). Compared to other factors such as terrorism, natural disasters and political crises that may affect the tourism sector, crises caused by epidemics have a more negative impact on the tourism sector than other sectors. In particular, it takes between 12-34 months for the effects of epidemic diseases to completely disappear from tourism regions. As an example from previous epidemics, the number of tourists going to Sierra Leone remained 50% below the number of tourists in the pre-epidemic period even after 35 months. Due to the SARS epidemic in Hong Kong, tourism demand declined in two quarters. Similarly, due to the disease seen in England in 2001, the growth of the tourism sector remained at its pre-epidemic level for two years (Khalilzadeh, 2020:2). It is estimated that the negative effects of the coronavirus epidemic on the tourism sector will last for 6-12 months at best (Gössling et al., 2020:15).

3. LITERATURE

With the declaration of the COVID - 19 outbreak as a pandemic, a very rich literature on its effects on both the aviation and tourism sectors has emerged. The literature on the tourism sector has generally focused on the tourism revenues of countries and stock market analysis of tourism companies. Akca (2020) examined the impact of the Covid-19 outbreak on air transport. As a result, he stated that the epidemic will last longer than previous crises and will leave more negative effects. Bahar and İlal (2020), in their study examining the impact of the Covid-19 epidemic on the tourism sector within the scope of controlled and healthy tourism, determined that the epidemic will create significant employment and income losses for the sector. Choudhury et al., (2020), in their study examining the effects of coronavirus on Indian tourism, stated that the Indian tourism sector will experience a loss of 125 trillion rupees (Rs) income throughout the year and 38 million people in the sector will lose their jobs. Foo et al., (2020) examined the initial impact of the coronavirus on the Malaysian tourism industry. They found that the cancellation of reservations and the postponement of travel plans had a major negative impact on Malaysia's tourism industry. They suggested that the economic stimulus package could be beneficial for the tourism sector to survive in this period. Gössling et al., (2020) stated that none of the epidemics in the last 40 years caused a long-term decrease in the global development of tourism, but the negative impact of the covid-19 epidemic on the tourism sector will be long-lasting. Günay et al., (2020), in their study examining the short-term effects of the coronavirus on the demand of tourists to Turkiye with the scenario analysis technique, estimated that there will be a decrease in foreign visitor arrivals between 5% and 53%. According to this estimation result, they said that the tourism income loss will be 1.5 billion and 15.2 billion dollars, respectively, according to the best and worst scenarios. Khalilzadeh (2020) investigated the effects of coronavirus on the tourism sector. Khalilzadeh stated that Covid-19 has affected the tourism sector more negatively than other epidemics. He also stated that the tourism sector can recover one or two years after the epidemic, but that structural changes will occur in the sector in this process. He stated that these changes will increase the tendency of localization, demand for different destinations will increase and new airline brands may emerge. Korkut et al., (2020) investigated the effect of coronavirus on BIST Tourism Index with ARDL bounds test approach. According to the results of the analysis, they determined the existence of a long-term relationship between the variables and stated that the recovery in the tourism sector will gradually increase. Menegaki (2020) has conducted research to minimize the negative effects of the coronavirus in the international tourism sector. He stated that due to international travel restrictions, the prices in the sector should be determined on the basis of domestic tourists and that a sustainable tourism structure can be created by reducing the number of tourists. Ranasinghe et al., (2020) examined the effects of coronavirus on tourism in Sri Lanka, emphasizing the importance of tourism in island countries such as Sri Lanka. Despite the negative situations in the tourism sector during the epidemic process, it has been suggested to give loans to businesses in the sector and to rent hotels especially to organizations providing quarantine services. In addition, it is suggested that the changes in consumer behavior after the epidemic should be learned thoroughly and that all stakeholders in the sector should pay attention to the problems. Wachyuni and Kusumaningrum (2020) investigated the effects of coronavirus on the tourism sector. As a result of the research, they stated that tourism mobility will be domestic-oriented for the post-epidemic period and that the holiday preferences of tourists will be for nearby places as much as possible. Yenişehirlioğlu and Salha (2020) investigated the effect of Covid-19 on Turkiye's domestic tourism by using semi-structured interview technique with 50 people who regularly take a vacation. Researchers have determined that most of the participants do not think of taking a vacation during the summer period, and that they will prefer places where people are less and social distance is high.

The literature related to the COVID - 19 pandemic and the aviation industry can be grouped under eight categories.

- The response of the industry to the pandemic and the strategies it has developed
- Impact of travel restrictions on the sector
- Travel behavior of passengers during the pandemic
- Analyzing the relationship between air traffic volume and number of cases

- The overall impact of the pandemic on the aviation industry
- Impact of government policies towards the aviation industry
- Stock market performance of airline companies during the pandemic and
- Environmental impacts.

Albers and Rundshagen (2020), Budd et al. (2020), Deveci et al. (2022) and Zhang et al. (2023) examined the responses of the aviation industry to the pandemic and the strategies developed by firms. Among these, Deveci et al. (2022) examined the Turkish airline industry while the others examined the European airline industry. Albers and Rundshagen (2020) and Budd et al. (2020) list the industry's responses to the pandemic as large-scale austerity measures, changing patterns of long-term strategic alignment (convergence) between European airlines and their business models, disruption of the consolidation process of the aviation industry, cancel bailout packages provided for airlines, updating flight operations, rationalizing fleets, reducing the number of personnel, and restructuring network capacities. In a study on the Turkish aviation industry, Deveci et al. (2022) concluded that the Turkish aviation industry was significantly affected by the pandemic and that the industry will be restructured with fewer firms. In addition, there has been a significant decrease in the salaries of employees due to the decrease in sector revenues. Finally, while the number of passengers in the Turkish aviation industry decreased significantly, the increase in cargo numbers is noteworthy. Zhang et al. (2023) analyzed the network changes of Europe's three largest Low-Cost Carriers (LCCs) easyJet, Ryanair and Wizz Air before Covid-19 and during the pandemic. They concluded that European LCCs further expanded their networks by entering markets already served by established LCCs, which increased competition among LCCs. This competition, in turn, reduced average ticket prices by about 10%.

Studies on travel restrictions can be listed as the impact of restrictions on epidemic prevention (Chinazzi et al., 2020; Daon et al. 2020), the impact on passengers (Monmousseu et al., 2020) and the overall impact on the aviation industry. Chinazzi et al. (2020) used the metapopulation disease transmission model to measure the impact of travel restrictions imposed to prevent the pandemic. The results of the model showed that infected travelers had already traveled to most Chinese cities at the time of the travel restrictions. It was also stated that travel restrictions delayed the spread of the disease within China by 3-5 days at most. It was determined that international case imports decreased by 80% due to travel restrictions. Daon et al. (2020) simulated the possible acceleration in the spread of the disease against the scenario of lifting or relaxing travel restrictions. For this, they used a probabilistic branching process-based approach using data on 1364 airports and population density. As a result, they found that the regions with the highest probability of being the source of new outbreaks due to the lifting of travel restrictions are airports in East Asia, India, Brazil and Africa. They also found that the variability in flight volumes and population densities requires dynamic measures to be taken for the pandemic. Monmousseu et al. (2020) analyzed the impact of airline travel restrictions during the pandemic from the passenger perspective. For this, they focused on four metrics based on data published by passengers and airlines on social media. These metrics are proposed to measure how travel restrictions affect the relationship between passengers and airlines. The proposed metrics show that each airline responds differently to COVID-19 travel restriction measures from the passenger perspective, which can be used by airlines and passengers to improve decision-making processes. Serrano and Kazda (2020) examined the effects of travel restrictions imposed during the pandemic on the aviation sector. According to the results obtained in the study, the recovery of the aviation sector will take longer than expected, airline capacity has decreased by approximately 70% and many airlines have temporarily stopped their operations, approximately 20% of the global fleet has been grounded in early 2020, governments should support airlines to continue their operations.

One of the most studied areas with the aviation industry during the pandemic period is related to the analysis of passenger behavior. Lamb et al. (2020) analyzed the travel behavior of passengers during the pandemic with a survey of 632 people from the USA. As a result, it was stated that the most important factor affecting the behavior of passengers was the perceived threat from COVID - 19. Gidumal and Gonzales (2021) sought an answer to the question of whether passengers plan to postpone the purchase of their vacation plane tickets after the pandemic ends. In the study, it was stated that the difference between the ticket purchasing behavior of the participants before and after the pandemic was

significant. The age of the participants, or whether they preferred LCC or FSC in their previous trips did not show any difference in their purchasing behavior. Lamb et al. (2021) reported that the more information passengers have about their flight, the more likely they are to trust the airline or airport, and that trust issues are likely to be experienced by all passengers with varying degrees of intensity, followed by emotions such as fear and concern for personal health and safety. Miani et al. (2021) investigated Australian tertiary aviation students' perceptions of the aviation industry and the skills needed to succeed in the aftermath of the COVID-19 pandemic. The results show that students perceive that the pandemic-induced downturn in the industry has created an oversupply of labor and that they are looking for support in developing their skills to be more competitive. In Piccinelli et al. (2021), sentiment analysis was conducted using 639 comments written by airline passengers about the coronavirus outbreak on the Italian National Consumer Union website. According to the results of the analysis, passengers are mainly concerned about compensation, cancellations, and the pandemic. They also express mixed and unpredictable emotions. Mixed and unpredictable emotions shows that passengers realize that airlines are facing unsustainable cash excess and revenue situation. Sotomayor-Castillo et al. (2021) examined airline passengers' attitudes and concerns towards infection prevention and control measures for travel health and safety during the COVID-19 pandemic. The results of the study are as follows; (1) about three-quarters of the participants are concerned about contracting an infectious disease during the flight, (2) about 10% perceive their health as a key priority for the preferred airline, (3) about 85% of the participants feel that disinfectant, sanitary wipes, and masks distributed during the flight make them feel safer. Zhang et al. (2021) examined changes in airline passengers' travel behavior. In the study, pandemic-induced psychological changes in passengers were examined and useful suggestions were made for the normalization process and recovery of the airline market in the post-pandemic period.

Some of the studies examining the relationship between air traffic volume and the number of cases during the pandemic period are Lau et al. (2020), Nakamura and Managi (2020), Sun et al. (2021) and Su et al. (2022). In Lau et al. (2020), the number of domestic and international travelers from China was compared with the number of COVID - 19 cases. As a result, it was found that there was a significant correlation between both domestic and international passenger volume and the number of COVID - 19 cases. Nakamura and Managi (2020) tried to calculate the relative risk of import and export of COVID - 19 virus. As a result, it was emphasized that China, Europe, Middle East, and East Asia, as well as the USA, Australia, northeast Asia and Latin American countries are at risk. Furthermore, flight restrictions from airports in regions with a high number of cases will further reduce the risk flow. Finally, the risk of some airports in China, Iran and European countries exporting the disease was calculated to be higher than the risk of importing it during the pandemic phase. Su et al. (2022) analyzed the spatial distribution of pandemic and civil aviation passenger volume and the impact of socioeconomic factors on civil aviation passenger transportation within the COVID-19 pandemic period, focusing on China. They found that COVID-19 spread from Wuhan to surrounding cities and had a positive spatial autocorrelation; civil aviation passenger volumes decreased significantly in cities where the virus continued to spread and recurred frequently. Thanks to the measures taken for the pandemic in China, the domestic passenger transportation sector recovered rapidly, while international passenger transportation services did not perform as well.

Studies investigating the general effects of the pandemic on the aviation industry can be listed as Sanchez et al. (2020), Sun et al. (2020), Andreana et al. (2021) and Hotle and Mumbower (2021). In Sanchez et al. (2020), airline seat capacity and air transport demand were analyzed to qualify the impact of COVID-19 on commercial aviation. According to the results, it was stated that the pandemic crisis will lead to consolidation and downsizing of the sector, public aid packages will negatively affect the competition, and the recovery in the industry will be slower than expected. In Sun et al. (2020), the effects of COVID - 19 on global air transportation were analyzed at different scales and linkages. The general findings are as follows; (1) air transport in the southern hemisphere was more affected than in the north, (2) the negative impact of the pandemic on international flights was greater than on domestic flights, (3) airports lost approximately 50% of their routes on a global scale, (4) according to network analysis across countries, the impact of the pandemic on countries is heterogeneous, (5) the hazard distribution across countries during the pandemic is constantly changing, (6) airports focusing on domestic passenger traffic have experienced different degrees of lockdown and partial desynchronization. Andreana et al. (2021) examined the impact of the COVID-19 pandemic on air

transportation at the macro-regional level. In the study, an 80% decrease in air transportation on a global scale was determined in 2020. According to the empirical results, the impact of the pandemic crisis and subsequent travel restrictions is much higher than previous crises. Moreover, this negative impact is higher for FCCs than for LCCs. Finally, it is emphasized that the economic sustainability of airlines is at risk and the financial support provided by countries to airlines will harm the future competitive environment. Hotle and Mumbower (2021) analyzed the impact of the COVID - 19 pandemic on US domestic air transport operations and commercial airline services within the scope of financial aid. According to the results, flights operated decreased by 71.5% in 2020 compared to 2019. In addition, the number of airlines serving domestic routes decreased by 32.1%. Tisdall et al. (2021) categorizes the experiences of the aviation industry, which has gradually faced the challenges of the pandemic period. They conclude that there has been a lack of applied learning by policymakers in the past and that the general support currently offered does not address the long-term resilience of the sector. It is also emphasized that policies that support aviation industry should be inclusive of all levels of the sector rather than airline centric.

One of the important topics related to the aviation industry is government policies related to the industry during the pandemic. In Czerny et al. (2021), the impact of government policies on airlines that suffered losses during the pandemic is discussed in China. The policies of China and many other countries to reduce the marginal costs of the aviation sector have been effective in reducing sector costs. In addition, capital injections and loan guarantees may be necessary for some airlines to continue their operations. Finally, it is emphasized that airlines in countries with small domestic markets and open economies will recover more slowly. Hou et al. (2021) examined the consequences of the slot liberalization policy implemented in the Chinese aviation industry after the pandemic, especially for large airports. As a result, it is stated that slot liberalization is an effective method to increase the traffic of airports. Slot liberalization implemented at large airports enables smaller airports to continue their operations with a lower subsidy. Rust et al. (2021) analyzes the effects of government subsidies to airlines and airports on the sector within the scope of businesses in the Duluth Minnesota aviation business cluster. The results show that the economic impact of the pandemic spread to the entire cluster and negatively affected many organizations. In line with other airports globally, the COVID-19 pandemic has reduced air travel volumes through Duluth International Airport starting in March 2020. The economic impacts of the pandemic have negatively impacted all service groups at the airport, such as FBO, catering, car rental and parking services.

The last two topics studied are the stock market performance of airline companies during the pandemic and environmental impacts. Carter et al. (2022) examined the stock market performance of travel-related firms (airlines, restaurants, and hotels) in the US in February - March 2020 within the scope of the COVID-19 pandemic. The study finds that larger firms with higher cash reserves and higher market-to-book ratios earn fewer negative returns, while firms with more leverage are penalized more. In addition, cash reserves are particularly important for hotels. Kotcharin et al. (2023) examined the effects of government policies on the weekly stock returns of 73 global airline companies in 36 countries during the pandemic period. It was concluded that the measures taken by the government reduced the negative effects of the pandemic on the stocks of airline companies. On the other hand, it is stated that economic support packages increase the negative impact on returns. Unlike other studies, Sobieralski and Mumbower (2022) examined the environmental impacts of increasing private aviation operations during the pandemic. It was found that the number of private aviation flights in the US increased by 20% with the pandemic, which led to a 23% increase in CO2 equivalent emissions. On the other hand, the long-term analysis concluded that emissions from private aviation flights will exceed 770 megaton-equivalent within three years.

4. EMPIRICAL ANALYSIS

4.1. Study Method and Data Set

The study aims to examine the impact of the coronavirus, which was seen in 2020 and spread rapidly, on airline tourism by using daily data in the period of 12.03.2020-14.12.2020 when the bans were the highest. In this context, the number of coronavirus cases and deaths to be used in the study; It was obtained from the European Center for Disease Prevention and Control and the daily international flights were obtained from the Eurocontrol database. In addition, the number of international flights

used in the study was considered as the dependent variable, and the number of coronavirus cases and the number of coronavirus deaths were used in the model as independent variables. The model reflecting the relationship between the variables is given in equation 1 below:

$$Flights = \alpha_1 Cases + \alpha_2 Deaths_i \quad (1)$$

Each country included in the study is expressed with the sub-index i in the equation.

4.2. Threshold Model (TAR)

The TAR (Threshold AutoRegresive) model first emerged as a result of Tong's work in 1978 and was later developed by Tong and Lim (1980) and Tong (1983). The nonlinear TAR model is used when the transition is sharp. The TAR model allows analysis of complex systems by dividing them into subsystems. Each regime is treated as a separate model in the system. The TAR model equation is given in equation 2 below:

$$\begin{aligned} Y_t &= \delta_1 + \beta_1 Y_{t-1} + \cdots + \beta_k Y_{t-k} + \varepsilon_{1t} \quad ; \delta_{t-d} < r \\ &\quad \delta_2 + \sigma_1 Y_{t-1} + \cdots + \sigma_k Y_{t-k} + \varepsilon_{2t} \quad ; \delta_{t-d} < r \end{aligned} \quad (2)$$

4.3. Findings

Descriptive statistical test results of the variables used in the study are in Table 1 below:

Table 1. Descriptive Statistics of International Flights, Number of Coronavirus Cases and Coronavirus Deaths

Variables	Beginning of Data	Number of Observations	Average	Standard Deviation	Skewness	Kurtosis	JB Test
IF	12.3.2020	278	10754.67	5028.282	-0.053396	1.911675	13.85199
CC	12.3.2020	278	65879.24	81703.78	1.381142	3.379615	90.05258
CD	12.3.2020	278	1493.428	1550.172	1.058592	2.899742	52.03838

According to Table 1, when the Jarque-Bera test statistical results are examined, it has been observed that the IF, CC and CD variables are not normally distributed. Considering the skewness values, this series is skewed to the right since the observations of the series of international flight numbers are generally higher than the mean of the series. The observations of the series of coronavirus cases and deaths from coronavirus are skewed to the left, as they are generally smaller than the average of the series in question. A positive kurtosis value indicates heavier tails and a higher peak than the normal.

In time series, the primary goal is to determine whether the variables are stationary in order to obtain consistent and reliable results. In the results of the stationarity test, which is also referred to as the unit root test, the fact that the series contains a unit root causes a spurious regression problem. The spurious regression also does not reflect the true relationship between the variables. For this reason, in order to evaluate the results obtained from the analysis correctly, a series should not contain a unit root (Gujarati, 1999: 726). Dickey-Fuller (DF, 1979), Augmented Dickey-Fuller (ADF, 1981) and Phillips-Perron (1988) are commonly used unit root tests to test stationarity in econometric analyses. In this context, the stability analyzes of the variables in the study were performed with Augmented Dickey-Fuller (ADF, 1981) and Phillips-Perron (1988) tests. The obtained unit root test results are in Table 2.

Table 2. Unit root (ADF and PP) Test Results of Variables

Variables	ADF(Level) With Constant-Trend	ADF (First Difference) With Constant-Trend	PP (Level) With Constant-Trend	PP (First Difference) With Constant-Trend
IF	-2.0159	-5.2092	-4.0507	-22.0997
	0.5896	0.0001***	0.0083***	0.0000***
CC	-2.9530	-2.7403	-2.4148	-19.3063
	0.1478	0.2213	0.3710	0.0000***
CD	-2.5723	-3.2872	-3.5448	-21.4826
	0.2935	0.0706*	0.0367**	0.0000***

Note: In the ADF test, the maximum lag length was taken as 15 and the lag length was determined to be 7 according to the Schwarz information criterion. In the PP test, the delay length was determined by the Barlett-Kernel method and the bandwidth was determined as 4 by the Newey West Bandwith method. *, ** and *** denote 10%, 5% and 1% significance levels, respectively.

Unit root tests were examined in both methods within the framework of fixed and trend models. When Table 2 is examined, when the first difference of the variables used in the study is taken according to the ADF test results, it has been determined that the other two variables are stationary, except for the coronavirus cases. According to the PP test results, it was determined that all variables were stationary at the 1 percent significance level when the first difference was taken.

After the unit root tests, the BDS test, which tests the independence of the residues, was applied to determine whether the variables have a linear structure.

The required lag length to establish the linear model analysis was determined as 8 by the Akaike information criterion. BDS test statistics results of the variables are in Table 3 below:

Table 3. BDS Test Analysis for Variables

BDS Test Analysis for International Flights Series									
IF	BDS Statistic	Std. Error	z-Statistic	P	C(m,n)	c(m,n)	A	B	C
ε/σ									
2	0.131972	0.000494	267.1799	0.0000	8166.000	0.213624	10923.00	0.285748	0.081652
3	0.145143	0.000320	452.9771	0.0000	6398.000	0.168590	10862.00	0.286219	0.023447
4	0.132570	0.000156	851.6725	0.0000	5249.000	0.139323	10800.00	0.286662	0.006753
5	0.116217	6.62E-05	1756.320	0.0000	4419.000	0.118152	10720.00	0.286623	0.001934
6	0.100255	2.60E-05	3852.602	0.0000	3743.000	0.100813	10653.00	0.286926	0.000558
A= C(1,n-(m-1)			B= c(1,n-(m-1))			C= c(1,n-(m-1))^k			
BDS Test Analysis for Coronavirus Cases Series									
CC	BDS Statistic	Std. Error	z-Statistic	P	C(m,n)	c(m,n)	A	B	C
ε/σ									
2	0.212840	0.008435	25.23251	0.0000	19117.00	0.500105	20488.00	0.535970	0.287264
3	0.322979	0.010344	31.22253	0.0000	18197.00	0.479499	20452.00	0.538920	0.156521
4	0.384101	0.009532	40.29759	0.0000	17723.00	0.470418	20421.00	0.542031	0.086317
5	0.415864	0.007699	54.01500	0.0000	17354.00	0.463998	20388.00	0.545119	0.048135
6	0.431428	0.005761	74.88829	0.0000	17025.00	0.458549	20351.00	0.548131	0.027121
A= C(1,n-(m-1)			B= c(1,n-(m-1))			C= c(1,n-(m-1))^k			
BDS Test Analysis for Coronavirus Deaths Series									
CD	BDS Statistic	Std. Error	z-Statistic	P	C(m,n)	c(m,n)	A	B	C
ε/σ									
2	0.185376	0.005527	33.53738	0.0000	13359.00	0.349474	15485.00	0.405091	0.164099
3	0.247847	0.005160	48.03521	0.0000	11967.00	0.315336	15451.00	0.407141	0.067489
4	0.265665	0.003621	73.36487	0.0000	11067.00	0.293749	15423.00	0.409370	0.028084
5	0.266171	0.002229	119.4281	0.0000	10398.00	0.278014	15402.00	0.411807	0.011843
6	0.259580	0.001271	204.2066	0.0000	9825.000	0.264625	15376.00	0.414135	0.005045
A= C(1,n-(m-1)			B= c(1,n-(m-1))			C= c(1,n-(m-1))^k			

According to the BDS test results given in Table 3, the Z statistics and probability values show that the variables are not linear in all dimensions. Since the variables included in the model in the study did not have a linear structure, the TAR model was applied to the variables. The TAR analysis results are in Table 4 below:

Tablo 4. TAR Analysis Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1.Regime FLIGHTS(-1) < 4567 -- 49 obs				
Coronavirus Cases	-0.004806	0.039727	-0.120974	0.9038
Coronavirus Deaths	-0.223285	0.296949	-0.751930	0.4528
C	4405.341	442.4823	9.955970	0.0000
2. Regime 4567 <= FLIGHTS(-1) < 7564 -- 41 obs				
Coronavirus Cases	0.033572	0.007238	4.638163	0.0000
Coronavirus Deaths	-1.263567	0.346030	-3.651615	0.0003
C	6590.123	347.8961	18.94279	0.0000
3. Regime 7564 <= FLIGHTS(-1) < 11087 -- 45 obs				
Coronavirus Cases	0.012803	0.004076	3.140886	0.0019
Coronavirus Deaths	-0.297985	0.213344	-1.396732	0.1637
C	8661.998	362.5666	23.89078	0.0000
4. Regime 11087 <= FLIGHTS(-1) < 15078 -- 71 obs				
Coronavirus Cases	0.017018	0.003306	5.147695	0.0000
Coronavirus Deaths	-2.195558	0.243436	-9.019041	0.0000
C	14138.76	221.2826	63.89459	0.0000
5. Regime 15078 <= FLIGHTS(-1) -- 71 obs				
Coronavirus Cases	-0.012069	0.011103	-1.087087	0.2780
Coronavirus Deaths	-2.517134	1.431461	-1.758437	0.0798
C	17739.47	309.6646	57.28606	0.0000

According to Table 4, as both the coronavirus cases and coronavirus deaths in the 1st regimen, the coronavirus deaths in the 3rd regimen and the coronavirus cases in the 5th regimen are not statistically significant, no interpretation can be made. In the 2nd, 3rd and 4th regimens, the coronavirus cases is statistically significant at the 1% level, and when the coronavirus cases increases by one unit, the international flights increases by 0.03, 0.01 and 0.02 units, respectively. While the coronavirus deaths was statistically significant at the 1% level in the 2nd and 4th regimens, it was statistically significant at the 10% level in the 5th regimen. In these regimes, when the coronavirus deaths increases by one unit, the international flights decrease by 1.26, 2.20 and 2.52 units, respectively.

5. CONCLUSION

Globally, it is known that economic, environmental, social and political changes have occurred as a result of epidemics in the past years. Almost every sector has been affected differently due to the new type of coronavirus, which was first seen in the People's Republic of China in December 2019 and named as Covid-19 in February 2020. As a result of the rapid spread of the virus in a short time, measures such as curfews, travel bans, closure of certain sectors for a while, applied to reduce and control the spread of the virus all over the world; It has caused serious economic problems, albeit in different dimensions, around the world. As a result of the rapid slowdown of international air travel, both international and domestic tourism declined within weeks, especially as many countries imposed travel bans, closed their borders and effectively used measures to restrict human mobility, such as quarantine practices, in order to prevent the spread. According to the Aviation Benefits Report published in 2019 before the pandemic, approximately 3.4 million people are directly employed in airlines, air navigation service providers and airports, and 1.2 million people are employed in the civil aviation sector (aircraft, system and engine production). Other airport positions employ 5.6 million people. Thus, the air transport industry employs about 10.2 million people. In addition, the aviation industry supports a total of 65.5 million jobs worldwide. According to the latest estimates of the cross-industry Air Transport Action Group (ATAG), the total economic impact of the global aviation industry has reached US$2.7 trillion (ICAO, 2019). With the pandemic, the decrease in aviation traffic, which was an average of 100,000 per day in 2019, was also effective in the financial losses of businesses operating in the aviation industry (ICAO, 2020). In addition, IATA (2020) highlighted that 25 million jobs are in danger due to the coronavirus. As of April 27, 2020, according to UNWTO data, international aviation tourism has been completely stopped in 156 (72%) of all destinations around the world. In March 2020, the Air Transport

Association estimated that global airline revenue would decrease by $29.3 billion to $113 billion in 2020 due to the contraction in global air demand due to the coronavirus (IATA, 2020). However, by the end of 2020, beyond the expectations, there was a loss of 1 trillion dollars in the sector and a decrease of 74 percent in demand compared to 2019 (UNWTO). For this reason, international aviation and international tourism has been the most affected sectors in this process. In this study, it is aimed to examine the effects of coronavirus cases and coronavirus deaths on international flights. In this context, the TAR model analysis was applied by aggregating the data for 38 selected countries in the study. The results of the analysis were realized as expected and the loss of life was more effective than the number of cases in the decrease in the number of international flights. As a result of the analysis, it was determined that a one-unit increase in the coronavirus cases increased the international flights, albeit slightly, while it was determined that a one-unit increase in the coronavirus deaths decreased the number of flights. In other words, the loss of life was decisive in taking the impact of the epidemic on human life seriously and understanding the importance of the epidemic. The number of coronavirus cases is statistically significant in the 2nd, 3rd and 4th regimens, and when the number of coronavirus cases increases by one unit, the flight numbers increase by 0.03, 0.01 and 0.02 units in these regimens, respectively. The number of coronavirus deaths is statistically significant in the 2nd, 4th and 5th regimes, and when the the number of coronavirus deaths increases by one unit, the flight numbers decrease by 1.26, 2.20 and 2.52 units, respectively, in these regimes.

The aviation sector is known as the sector that stands out among the transportation sector and has increased its share over the years in terms of transportation being faster and easier. International transportation is carried out in line with economic activities as well as social and cultural developments. In this context, air transport mobility also plays an important role in the global economy with its complex and intertwined effects on economic systems. However, in any crisis experienced, the social and cultural origin air passenger transportation, which is more flexible than the demand from economic origin, is more affected in the crisis and experiences great negativities in the sector except for the transfer of goods and services. In addition to economic policies during the crisis, direct aids to be made in the sector will prevent possible bankruptcies. It is recommended to try to revive the tourism sector and to include support and incentives to prevent the decrease in employment in this sector, among the main policies to be implemented for the post-pandemic passenger transport sector. In addition, the document on the disinfection rules to be applied at airports, published by the World Health Organization during the coronavirus pandemic process, is the first measure to be taken into account in possible future pandemics. In the case of suspicious cases seen at airports during the pandemic process, carrying out the process within the scope of the airport emergency plan in coordination with the airport health authorities and public health authorities and taking measures accordingly are the measures that will reduce the contagiousness and the size of the epidemic. In order to prevent further infection risk, airport health services should work in coordination with the units that provide airport support services such as aircraft cleaning and cargo-luggage loading, water loading and wastewater services (WTO, 2020). In addition, countries should detect the body temperature of people by using thermal cameras at airports, in case the disease is a global epidemic from the onset of such an easily contagious disease. They should frequently disinfect places used by passengers and staff, such as toilets, luggage carts, elevators, and passenger waiting areas. Disinfectant points should be established in accessible places for the use of passengers and staff. In order to prevent contamination, markings should be made to ensure the distance between passengers and disinfection should be done in ventilation filters and ducts. The fact that no one other than passengers is allowed in the terminal buildings is the main measure that can reduce human circulation and contagion at airports. Although all these measures cannot prevent the epidemic, they will at least reduce the contagion and still make the aviation and tourism sector less affected. Apart from this, considering the fact that all sectors have been destroyed socio-psychologically and economically

in order to ensure recovery in the post-pandemic sector, there is a need for a sharing understanding rather than inter-sectoral competition in the post-pandemic recovery process. Because the recovery in only one sector will not help to solve the problems, and it will not be able to provide consumer confidence on its own. For this reason, it is necessary for all stakeholders to have a common sensitivity in order to give confidence to the markets and to eliminate the risk perception. Apart from that, as the United Nations has said, the new normal will not be the same as the old one. Since it is the subject of the study, every sector such as the travel and tourism sector will be affected by these losses in its own way and it will take time to return to real normal. Considering the direct and indirect effects of tourism, travel and transportation on many sectors, a strong cooperation becomes necessary for a return to normalcy as in the past. In this context, considering the interdependence of the tourism and aviation sectors, all kinds of tourism activities may affect international aviation as well as domestic aviation. As hygiene will be prioritized in the accommodation sector within the scope of the new normal understanding, hotels that take hygiene into account will be the priority choice. Since businesses will encounter more conscious tourists, even though it is a cost factor, providing services with a hygiene concept will ensure that they are preferred outside the epidemic period. This will also attract foreign tourists from abroad as an opportunity, which in a sense means an increase in the demand for the international aviation sector.

On the other hand, the decrease in environmental pollution with the realization of closures and quarantines and the need for a more isolated holiday in rural areas by avoiding the crowds brought by the pandemic will bring new job opportunities and employment to the tourism sector. In this case, while it is an event that attracts foreign tourists, it is also an event that can cause labor mobility between countries. Therefore, all kinds of vitality in the tourism sector will also significantly increase international aviation. For this reason, the stakeholders in the sector should both take the precautions to be taken before the pandemic in a possible new pandemic and put forward practices that will minimize the negative effects that may occur on the sector during and after the pandemic. In addition, it should develop ideas for the new normal understanding in order to enter a rapid recovery process after the pandemic.

Ethical Statement

The rules of research and publication ethics were followed during the writing and publication process of the study, and the data collected was not tampered with. Ethics committee approval is not required for the study.

Contribution Rate Declaration

All authors contributed to all processes from writing the study to drafting the manuscript and read and approved the final version.

Conflict Statement

This study did not lead to any individual or institutional/organizational conflict of interest.

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Extended Abstract
First Period Effect of Covid-19 on International Aviation Tourism

Aim: The study has three interrelated objectives. Firstly, the study provides a situation assessment, including the decrease in air traffic caused by documented case-fatality reports between 12.03.2020 and 14.12.2020. Secondly, the impact of the damage to the tourism sector in 2020 and beyond is summarized by comparing it with data from previous years. Thirdly, information is given about the change in consumer behavior due to the pandemic and suggestions are offered to eliminate the negative effects of the epidemic in the tourism sector. In this context, it is aimed to fill the gap in the existing literature by analyzing the simultaneous effect of the number of cases and deaths on number of air passengers for different periods.

Method: In the study, a threshold autoregressive (TAR) model was created within the scope of data from 38 selected countries. The number of coronavirus cases and deaths to be used in the study; It was obtained from the European Center for Disease Prevention and Control and the daily international flights were obtained from the Eurocontrol database. In addition, the number of international flights used in the study was considered as the dependent variable, and the number of coronavirus cases and the number of coronavirus deaths were used in the model as independent variable.

Findings: The results of the analysis were realized as expected and the loss of life was more effective than the number of cases in the decrease in the number of international flights. As a result of the analysis, it was determined that a one-unit increase in the coronavirus cases increased the international flights, albeit slightly, while it was determined that a one-unit increase in the coronavirus deaths decreased the number of flights. In other words, the loss of life was decisive in taking the impact of the epidemic on human life seriously and understanding the importance of the epidemic. According to the findings, as both the coronavirus cases and coronavirus deaths in the 1st regimen, the coronavirus deaths in the 3rd regimen and the coronavirus cases in the 5th regimen are not statistically significant, no interpretation can be made. In the 2nd, 3rd and 4th regimens, the coronavirus cases is statistically significant at the 1% level, and when the coronavirus cases increases by one unit, the international flights increases by 0.03, 0.01 and 0.02 units, respectively. While the coronavirus deaths was statistically significant at the 1% level in the 2nd and 4th regimens, it was statistically significant at the 10% level in the 5th regimen. In these regimes, when the coronavirus deaths increases by one unit, the international flights decrease by 1.26, 2.20 and 2.52 units, respectively.

Conclusion: With the pandemic, the decrease in aviation traffic, which was an average of 100,000 per day in 2019, was also effective in the financial losses of businesses operating in the aviation industry (ICAO, 2020). IATA (2020) highlighted that 25 million jobs are in danger due to the coronavirus. As of April 27, 2020, according to UNWTO data, international aviation tourism has been completely stopped in 156 (72%) of all destinations around the world. In March 2020, the Air Transport Association estimated that global airline revenue would decrease by $29.3 billion to $113 billion in 2020 due to the contraction in global air demand due to the coronavirus (IATA, 2020). However, by the end of 2020, beyond the expectations, there was a loss of 1 trillion dollars in the sector and a decrease of 74 percent in demand compared to 2019 (UNWTO). For this reason, international aviation and international tourism has been the most affected sectors in this process. In this context, air transport mobility also plays an important role in the global economy with its complex and intertwined effects on economic systems. However, in any crisis experienced, the social and cultural origin air passenger transportation, which is more flexible than the demand from economic origin, is more affected in the crisis and experiences great negativities in the sector except for the transfer of goods and services. In addition to economic policies during the crisis, direct aids to be made in the sector will prevent possible bankruptcies. It is recommended to try to revive the tourism sector and to include support and incentives to prevent the decrease in employment in this sector, among the main policies to be implemented for the post-pandemic passenger transport sector.