

CAUSALITY ANALYSIS BETWEEN GDP GROWTH AND AIR TRANSPORT
INDICATORS IN TURKEY

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PLAGIARISM

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ABSTRACT

In this research; causality analysis between gdp growth and air transport indicators in turkey for the period 1960-2019 will be analyzed. The extent of interaction between some airline data and GDP in Turkey is studied. stationary, johansen co-integration and granger causality tests were conducted to analyze the relations between GDP and air transport data (cargo quantity, number of passengers carried and oil prices) in Turkey. The unit measures of the variables obtained as measurement data in the analyzes; GDP and oil prices are in dollars, the number of passengers carried is in persons and the amount of cargo in tons. In the applied analyzes; the logarithms of the gross domestic product growth rate (GDP), the total number of passengers at the airports in Turkey (PAX), the amount of cargo carried in tons (cargo) and the average annual oil prices (OPEC) are used.

Stability tests for examining the relationships between stationary variables in the design phase of the regression model used in the research; has been made. Therefore, with the help of the "Augmented Dickey-Fuller unit root test (ADF)", it was examined whether the variables in the data set used were stationary; It has been determined that all variables of the series have a unit root and therefore are not stationary.

As a result of the johansen co-integration test conducted for this study; The calculated trace values and test statistics of the eigenvalue were calculated, it was decided that there were 2 cointegrated equations and it was determined that there were 2 long-term vector relationships between the variables.

When the results of the granger causality test are examined; there is a causal relationship between the amount of cargo carried by the gross domestic product. However, it has been determined that there is no causal relationship between the fuel price, the total number of passengers carried and the gross domestic product. As a result of this research; it is expected to make significant contributions to the literature empirically on the relationship between aviation and GDP growth in Turkey.

Keywords: *Aviation Industry, Air Transport, GDP and Causality Analysis, Turkey.*

ÖZET

Bu tezde, 1960-2019 dönemi için Türkiye'de GSYİH Büyümesi ile hava taşımacılığı göstergeleri arasındaki nedensellik analizi incelenecektir. Türkiye'de bazı havayolu verileri ile GSYİH arasındaki etkileşimin kapsamı analiz edilmiştir.

Durağanlık, johansen eş bütünleşme ve granger nedensellik testleri yapılmıştır. Yapılan analizlerde ölçüm verisi olarak elde edilen değişkenlerin birim ölçüleri; GSYİH ve petrol fiyatları için dolar, taşınan yolcu sayısı birimi kişi ve kargo miktarı ise ton şeklindedir. Uygulanan analizlerde; gayri safi yurtiçi hasıla büyüme oranı (GSYİH), Türkiye'deki havalimanlarındaki toplam yolcu sayısı (PAX), ton cinsinden taşınan kargo miktarı (kargo) ve ortalama yıllık petrol fiyatları ile ilgili (OPEC) logaritmaları kullanılmıştır.

Araştırmada öncelikle kullanılan regresyon modelinin tasarım aşamasında durağan değişkenler arasındaki ilişkilerin incelenmesi için kararlılık testleri; yapılmıştır. Dolayısıyla, "Genişletilmiş Dickey-Fuller birim kök testi (ADF)" yardımı ile kullanılan veri setindeki değişkenlerin durağan olup olmadığı incelenmiş; serinin tüm değişkenlerinin birim kök taşıdığı ve dolayısıyla durağan olmadığı tespit edilmiştir.

Bu çalışma için yapılan johansen eş bütünleşme testi sonucunda; hesaplanan iz değerler ve özdeğerin test istatistikleri hesaplanmış, 2 adet eşbütünleşik denklem olduğuna karar verilmiş ve değişkenler arasında 2 adet uzun dönemli vektör ilişkisi olduğu tespit edilmiştir.

Yapılan granger nedensellik testi sonuçları incelendiğinde; gayri safi yurtiçi hasıla ile taşınan kargo miktarı ile gayri safi yurtiçi hasıla arasında nedensellik ilişkisi olduğu; ancak, akaryakıt fiyatı ile taşınan toplam yolcu sayısı ve gayri safi yurtiçi hasıla arasında nedensellik ilişkisinin olmadığı tespit edilmiştir. Bu araştırma sonucunda; Türkiye'de havacılık ve GSYİH büyümesi arasındaki ilişki konusunda ampirik olarak literatüre önemli katkılar sağlaması beklenmektedir.

Anahtar Kelimeler: *Havacılık Endüstrisi, Hava Taşımacılığı, GSYİH ve Nedensellik Analizi, Türkiye.*

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ABBREVIATIONS

ABAG	:	Brazilian General Aviation Association
Acraft	:	Aircraft Traffic
DHMI	:	State Airports Authority
WHO	:	World Health Organization
EBIT	:	Earnings Before Interest And Tax
GECAS	:	Ge Capital Aviation Services
GDP	:	Gross Domestic Product
ILFC	:	International Lease Finance Corporation
OPEC	:	Organization Of Petroleum Exporting Countries
PAX	:	Passengers
RPK	:	Income Passenger Mileage
SARS	:	Severe Acute Respiratory Syndrome
T.R.	:	Republic Of Turkey
THY	:	Turkish Airlines
TURKSTAT	:	Turkish Statistical Institute
UNWTO	:	World Tourism Organization
ÜYK	:	Income Passenger Mileage
ETC.	:	Et cetera
ET AL.	:	And Others
WDI	:	World Development Indicators

CHAPTER 1. INTRODUCTION

Air transport is one of the industries that survived the global financial crisis, which is also critical of competitive strategies. With globalization, country borders have also been removed and people's transit between countries has become easier. This has resulted in the safe transportation of people to almost all parts of the world. On the other hand, the aviation sector has also contributed to meeting the population needs and providing employment in significant proportions. Due to the globalization process, the demand for passenger and freight transportation is increasing day by day. The acceleration in transport demand has a natural effect on the distances freight generally move. International logistics provides an economic benefit in terms of sustainability in the global competition arena. As the supply and distribution channels around the world have become very complex; there has been a significant increase in airline passenger and freight transport and its share in the Gross Domestic Product (GDP) has increased. The effect of its performance in the air transport market; third countries have also increased its market share in the USA and EU market (Goetz, 1992: 219).

As a result of globalization, the increase in the demand for air transport does not progress day by day. The higher mobility advantage of the new aviation is shaping aviation at the international level, an important starting point for how to coordinate complex processes around the world. In this context, air transport has an important place not only in domestic markets, but also in the international arena of economies, shaping and increasing international trade.

Therefore, it is aimed to analyze the relations between GDP and air transport data in Turkey for the period 1960-2019, the amount of cargo, the number of passengers carried and oil prices. For this purpose, logarithms of the gross domestic product

growth rate (GDP), the total number of passengers at airports in Turkey, the amount of cargo carried in tons and the average annual oil prices were used to answer the research questions. By using the aforementioned logarithms in order to obtain the results for the purpose of the research; stationarity, Johansen cointegration and Granger causality tests were performed.

If the topics in the thesis are listed:

In the first chapter, information about general air transport is given. In the second part, previous empirical studies on the subject of the study, the reasons for the demand for air travel, the importance of low-cost air passenger transportation, the relationship between oil prices and air transportation were examined.

In the second chapter; the contribution of the aviation industry to GDP, cargo transportation in airlines, and the relationship between passenger and cargo transportation in air transportation are included. In the fourth chapter; The effects of the crisis on employment in the aviation industry, the aviation industry due to the terrorist attacks in Turkey in 2016, the Indian economy crisis and the aviation industry, the global economic crisis in Brazil, the United States of America September 11, 2001 crisis, the severe acute respiratory syndrome (sars) between 2002-2003. crises, economic crises in the aviation sector in the period 2008-2009 were examined.

In the third chapter, under the title of materials and methods; research data, descriptive statistics, methodology, purpose of the research, importance of the research, hypotheses of the research, analysis of the data, Regression Model, Stationary Tests, Johansen Co-Integration Test and Granger Causality Tests were conducted. The results and recommendations of the research were written by using the data obtained as a result of the analyzes made.

CHAPTER 2. REVIEW OF LITERATURE

2.1. Aviation Industry Conceptual Framework

Airlines businesses are obliged to transport people or goods from one place to another by plane. The first scheduled commercial air service, dating back to early 1914, was carried out for the first time by the American pilot Tony Jannus between the cities of Saint Petersburg and Tampa. The 27-kilometer journey was completed in 22 minutes and started for just \$ 5.

Table 1

First Commercial Flight Time Table

St Petersburg- Tampa
Boat Line
Fast passenger and express service
Program:
Leave: St. Petersburg 10:00 A.M
Arrival: Tampa 10:30
Leave: Tampa 11:00
Arrival: St. Petersburg 11:30 A.M
Leave: Tampa 15:00
Arrival: St.Petersburg 15:30

Source: (Harding, 2006: 5-6).

After the first scheduled commercial air service started, the importance given to air traffic and related activities gradually increased. This has allowed users to travel on more than 20,000 air connections covering the entire planet, providing a reliable alternative to road, rail and maritime transport. Since 1945, it is estimated that global air traffic has doubled every fifteen years (thanks to an average annual growth rate of 5%), while the number of passengers exceeded 3 billion in 2012. In this context, it is possible to say that the aviation industry has a very strong and unchangeable trend. The recovery

of various global crises can only be observed in a very limited period (one or two years). However, Airbus, Boeing, and all aviation observers both agree on the growth of civil air transport. On the other hand, developing regions (especially Southeast Asia) will benefit from up to 10% annual air traffic, representing 60% of global air traffic in 2032 (Porter, 1980: 217). Observation of demographic developments shows that it is an important indicator in positioning the proposal in aviation. Meeting the demands of the increasing population and ensuring a consistent increase in flight routes is one of the most important works of the airline management. It is thought that by 2030, 61% of the world's population will live in an urban area, compared to 52% today, and will exceed 8 billion in 2030 and 9 billion in 2050. Developing countries currently represent important growth centers for the aviation industry. In 2025, 11 of the 13 most populous cities in the world will come from them. This strong demographic growth should also be attributed to the accessibility of an increasingly significant portion of the population to the middle class. For example; 62% of the world's population in 2032 against 32% in 2013. When this level of wealth is reached, the proportion of people using air transport will also be greater. However, it should be observed whether the increase in traffic is due to the collective access or excessive consumption of the richest population rather than the idea that all this population will have easier access to air transport (Wang et al., 2004: 40).

Globalization has led to the removal of borders of countries and most people have the right to reach many countries. Thus, people began to move safely to other parts of the world. For this reason, the role of transportation by plane has become very important. Meanwhile, the crises that occurred have affected the airline industry in different ways. For example, ground services such as transportation and freight, airport services offered to passengers are also provided directly. At the same time, examples

such as ticketing, food and beverage and baggage handling services can be given. They are all part of the airline industry and are interconnected. Also, GDP is supported by the airline sector and many people are working in Turkey (Vidovic, et al., 2013: 80).

The crisis has direct and indirect effects on the aviation industry in Turkey. The first is related to the service and workforce of airlines. Employment provided by the airline industry is indirectly related to the output of companies. Another is related to foreigners traveling and doing business domestically. It is the operating expenses of foreign visitors traveling to Turkey by plane. The volume of these activities is determined by the level of air transport. The aviation industry in Turkey has cyclical effects. It is related to distributions such as fuel prices, catering services, commercial services, rental services, ticket sales, travel agencies, repair and maintenance of aircraft (Bakırcı, 2012: 340).

Another point is that the aviation industry is not affected by the world economy. Because the focus was only on the development of the air transport industry, and despite the financial crisis, world air traffic continued to improve. For example; Annual Passenger Kilometer (RPK) traffic did not drop significantly during the 2008 crisis and even began to rise in the wake of financial recessions. Air travel continues to be a growing market in the world. In this study, the causality test between aviation and economic indicators in Turkey will be analyzed. Because there are not enough studies to empirically investigate the relationship between aviation and GDP growth in Turkey. Therefore; This study is expected to fill this gap in the literature and make significant contributions to the literature (Chan, 2000: 513).

Domestic passenger traffic reached 2 million 956 thousand 528 and international passenger traffic reached 1 million 924 thousand 772 persons in the said month at the airports serving throughout Turkey. The freight (cargo, mail and baggage) traffic at

airports reached 2 million 403 thousand 959 tons, 502 thousand 265 tons on domestic flights and 1 million 901 thousand 694 tons on international flights Turkish Airlines [THY], (2020). The sector also provided job opportunities for other subsidiary sectors such as aviation fuel and catering. These can be referred to as "supply chain jobs", meaning connected businesses. Thus, they contribute directly and indirectly to Turkey's GDP (General Directorate of State Airports Authority [DHMI], (2019): 32; Holloway, 2008: 88).

In 2013, the number of air passengers exceeded three billion on all global routes. First of all, the civil air transport sector enables developing countries to achieve a growth of 5% by taking advantage of their economic and demographic dynamism and to double the number of passengers transported every fifteen years. Therefore, the mutual impact of the world economy and the growth of civil air traffic are closely examined by the governments and manufacturers in the aviation sector (Gerede, 2011: 514). The aviation industry meets 3.5% of global GDP, generates \$ 56.6 million direct and indirect jobs, and its operations generate an annual impact of about \$ 2.2 trillion. A nonprofit Air Transport Action Group, the mutual impact of air traffic and the real economy cannot be underestimated. One of the most recent demonstrations was the observation of the results of the "Eyjafjallajökull" volcano eruption in Iceland in the spring of 2010. This boom slowed the economic recovery after the 2008 financial crisis. This event, which lasted for several weeks, resulted in more than 100,000 cancellations that prevented the flight of eight million passengers. In addition to its direct effects on airlines and airports, it is estimated to result in losses of \$ 2.2 billion for the first week alone. At the same time, the World Tourism Organization (UNWTO) estimates that losses for European tourism alone are 1.7 billion Euros (Durgun, 2016: 39).

Moreover; The global economic environment plays an important role in forecasting. If good air traffic performance really affects the world economy, the opposite is likely to be true. There are four different phases where real GDP growth and air traffic growth follow exactly the same pattern. These examples pay homage to the “business cycle from 1974 to 1982, 1983 to 1991, 1992 to 2001, and 2002 to 2009. Over the next two decades, the IMF estimates that global GDP will grow by an average of 3% annually, allowing producers to rely on air traffic to benefit from 4.5% to 6% annual growth (Gerede, 2010: 87).

It is an important issue for airlines to ensure that the passenger transportation and transportation prices of the airlines are in line with customer expectations. Strong urbanization and the increase in middle class passengers' demand in developing countries facilitates access to air transport and increases in airline activities and increases in profitability. It represents a figure between 30% (for small aircraft) and 50% (for large carriers) of the total cost for airlines. For this reason, all companies involved in civil air transport show great interest in aircraft that consume less and consume with better performance. However, fuel is becoming the biggest expense for airlines (Holloway, 2008: 82). Therefore, factors affecting the total productivity of the country's economy also require efficient use of energy resources (Sevencan, 2018: 189).

The aviation industry contributes to a country's economy and employment. It was stated that in 2007, the air transport industry created an added value of US \$ 425 billion and directly employed more than 5.6 million people worldwide. These direct jobs include aviation designers and aviation vehicle manufacturers, personnel assigned to aircraft maintenance, pilots and cabin crew, controllers, airline customer service agents, baggage handlers, security and other personnel working on the ground. At the same time, the sector indirectly creates jobs at the hardware provider level within the scope of

the supply chain in aviation, accounting firms and insurance companies. Moreover, the direct or indirect purchase of goods and services contributes to the creation of promoted jobs. Therefore, when indirect and induced jobs are included, the sector contributes to the employment of 15.1 million people (Doganis, 2002: 27-28). Data on expenditures, employment and economic activities in the economy; supports experts in making predictions and can facilitate decision-making for managers. (Öner, et al., 2019: 43).

Civil aviation also has many features. First of all, civil aviation is a truly international sector but is based on national decisions. States are often proud of airlines because it is a sector subject to strong national and international regulation, partly for safety and security, but also for economic reasons and policies. At the same time, the liberalization brought to the sector at the end of the seventies led to the diversification of airline types. Finally, the labor market in civil aviation is highly divided and job profiles are quite different (Vasigh, et al., 2010: 45-46).

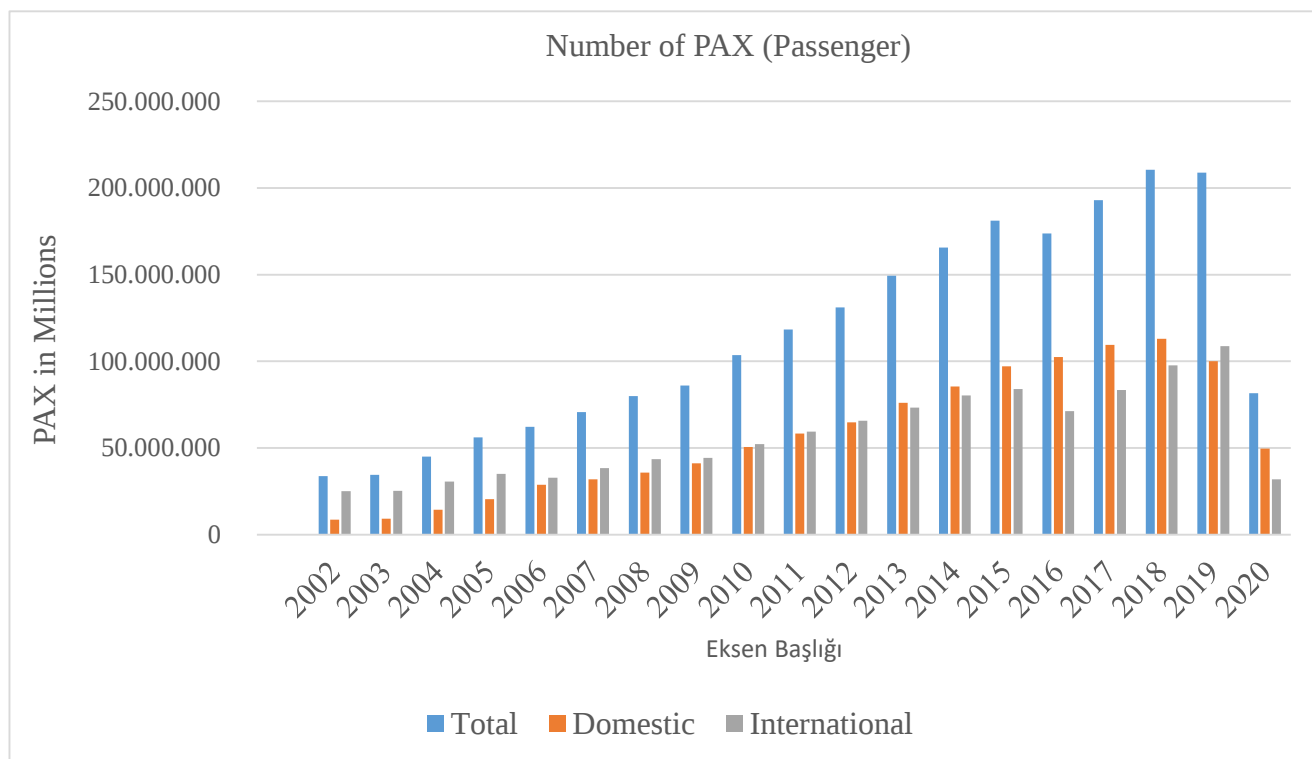
This distinction between professional interests is also reflected in professional relationships across the sector. Demand in air transport, represented by fluctuations, constants and directional flows, is cyclical, seasonal and fragile. Factors affecting air traffic include gross domestic product (GDP), population growth, political stability, the importance of leisure time, and access to markets. Business trips are particularly sensitive to fluctuations, and this feature has a significant impact on companies' revenues (Shaw, 2007: 31). Airline stock is mostly made up of seats they have on each flight, so the fragile nature of the service makes the area very vulnerable to external crises. On airlines with low air traffic growth, profitability may be extremely low. In the past, air traffic growth has doubled the GDP. Thus, in 2011, the passenger / kilometer ratio (the transport of a passenger by plane) grew by 6.5 percent worldwide, while the global GDP growth was only 3.7 percent (Taşlıgil, 1997: 90).

Gerede, (2012: 95) analyzed the relationship between airline demand and economic growth in China and used panel data in their articles. Thus, he found that a 1% increase in airline passenger traffic led to a 0.90% increase in economic growth. Button and Yuan (2013: 331) examined the empirical relationship between air cargo transportation and local economic growth in the United States and concluded that air cargo transportation has a positive effect on the economic growth of the USA.

The number of passengers transported by air in Turkey has increased in recent years. Kaya, (2000: 24) stated that aviation companies are organizations that provide data solutions that support strategic decision making and that Turkey will rise in the aviation sector. In this context, Istanbul Airport, the third airport of Istanbul, has also been awarded with its architecture. The success of the aviation industry stems from low cost labor and economic growth. In Turkey, Turkish Airlines (THY) is used to provide suitable conditions for international passenger traffic. In the aviation industry, "PAX" is used to mean passenger. The number of passengers transported in Turkey increased by approximately 14% between 2003 and 2012, whereas the number of international passengers transported increased 11% and the number of domestic passengers increased by 24%.

Figure 1

It is the graph based on the number of air passengers in Turkey from 2002 to 2020



Source: General Directorate of State Airports Authority [DHMI], (2021)

As can be seen in the figure 1, the total number of passengers has consistently increased every year. Even though there were abnormal events (terrorist attacks and military coup attempt) in Turkey, it increased by approximately 2.48% from 2015 to 2016 and increased by 9.34% in 2017. In addition, the number of domestic passengers increased from 26,304,000 to 30,130,000 from 2015 to 2017, and the number of international passengers increased by approximately 10.14%.

2.1.1. Empirical Working Models

Previous research on the thesis, econometric models and the methods they used are listed in Table 2. There are not enough studies in the literature.

Table 2*Empirical Research*

Made works	Econometric Model	Method	Reference
"Causality Analysis Between Airline Industry and Economic Growth: An Empirical Practice on Turkey "	$LGDP = LIY + LDY$	Toda and Yamamoto (1995) causality test	Kasım KİRACI, 2018
"The Impact of the Global Financial Crisis on the Indian Aviation Industry: Case Study of Air India Limited "	$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$	Multiple Regression Model	KHAN & JOHRI, 2014
"Aviation Demand and Economic Growth in the Czech Republic: Cointegration Prediction and Causality Analysis "	$LGDP = LPAX$	Cointegration Regression Estimates (Fully Modified OLS, Dynamic OLS, Conical Cointegration Regression)	Mehmood ve Shahid (2014)
"The Causality Relationship Between Liberalization and Economic Growth in Air Transport: The Case of Turkey "	$y_t = v + A_1 y_{t-1} + \dots + A_p y_{t-p} + \varepsilon_t$	Hacker and Hatemi-J (2006) Leveraged Bootstrap approach	Akar, Manga & Bal (2019)
Causality analysis between GDP and transport	-	Panel data analysis	Beyzatlar, Karacal & Yetkiner (2014)
Economic Growth And Inflation Relationship In India: Var Analysis And Causality Analysis	Inflation, real GDP growth rate and gross domestic product per capita	Stability and Cointegration Tests	Ozgur Uysal (2019)

Toda and Yamamoto causality analysis were used to find the relationship between GDP and Air transport demand. LIY means the number of domestic passengers and LDY means the number of international PAX. It is concluded that there is an important causal relationship between per capita GDP and domestic or international passenger demand. Accordingly, there was a significant 10% increase between GDP and domestic passenger demand. It also shows that the increase in GDP affects not only domestic airline but also international airline demand (Tenant 2017: 211).

The public sector in India focused on defense policies economically. "Hindustan Aeronautics Limited" (HAL), a defense firm, has been bringing together the bulk of the Indian aviation industry since 1964. It is a company fully owned by the State of India and controlled by the Ministry of Defense. The company is ranked as the 38th defense

company worldwide. HAL is trying to outsource an increasing portion of its manufacturing activity to the Indian private sector (about 25% to date). From 2010 to 2011, a turnover of 55 million EUR was achieved in exports. HAL is a subcontractor of foreign companies (service provider to a general contractor). HAL employs 33,500 employees. The main industrial establishments are located in the city of Bangalore. Khan and Johri (2014: 91) analyzed the relationship between global financial crises in the aviation industry in India using a multiple regression model. They concluded that the increase in fuel prices and payment to employees had a direct impact on EBIT (earnings before interest and tax). However, they concluded that other expenses, such as passenger revenues and administrative and communication fees, had no effect on EBIT.

Mehmood ve Shahid (2014: 61) analyzed the causality relationship between aviation demand and economic growth. Accordingly, it has been concluded that there is a positive relationship between airline demand (passenger transported) and GDP in the Czech Republic.

Akar, et al., (2019: 1160) Using the data of the World Trade Organization (WTO) Liberalization Index, the Aviation Liberalization Index (HLI) was prepared in Turkey. The causality relationship between this index and Turkey's GDP has been tested. Leveraged Bootstrap study developed by Hacker and Hatemi-J (2006) was used as an approach.

In their study, Kiracı and Battal (2017: 1536) examined the relationship between air transport and GDP, using the Panel Causality Analysis technique with the 1990-2016 period data for 70 countries grouped by income level. As a result of the analyzes made in the study, in which GDP per capita and airway variables were used, a causal relationship was obtained between GDP and airway. In addition, the direction of the

causality relationship from GDP to air transport or from air transport to GDP is among the empirical findings that vary according to the income level of the countries.

Brida and Bukstein (2016: 52) examined the relationship between air transport and economic growth in Italy in the Co-Integration and Granger Causality Framework using the 1971-2012 period data. The variables of GDP and number of flights were used in the study. As a result of the cointegration test, a positive relationship was found between the series in the long run. In addition, according to the results of the causality analysis, there is a one-way causality relationship from air transport to GDP.

It was determined that the variables were stationary at the first level in the Augmented Dickey Fuller and Phillips Perron unit root tests. Then, causality relation was not found from GDP to HPA variable with the leveraged Bootstrap approach. But; It has been determined that there is a causality relationship from HP to GDP.

Uysal (2019: 236) He researched the relationship between inflation and economic growth for India with analysis of variance decomposition and causality tests. Annual data between 1980 and 2014 were used. As a result; He determined the one-way causality relationship from economic growth and GDP per capita to inflation. A one-way causality relationship has been found from economic growth to GDP per capita.

2.1.2. Airline Demand

The aviation industry has played an important role since the early years of the republic (Akca, 2020: 179). Akar, et al., (2019: 1162) stated that civil aviation was under state control until 1983 and had a monopolistic structure in the sector. With a special law enacted later, private sector activities were allowed. Turkey is also important due to its geographical location and interconnecting continents. The importance of tourism revenues in economy, geographical location and international relations has an important effect on air transport. Therefore, airline passenger demand is

one of the most important indicators of the development of airline transportation. Francis, vd., (2005: 210), Paid Passenger Kilometers (UYK) increased by 7.5% compared to the previous years. ÜYK shows the actual passenger traffic of the airline. In this context, while the aviation sector grew by 5% in the world, the growth rate of Turkey was 3 times higher than the world and is approximately 15%.

Demand is defined as the number of economic products and services that customers want to buy at different price levels and can buy in terms of purchasing power in the market in a given period of time (Pilinkienė, 2008: 24). Airline demand is defined as the amount of service that can be purchased at the desired price in a certain period (Gerede, 2015: 196). Airline demand is influenced by many factors such as economic factors, population structure, geographical factors, and socio-cultural factors (such as people's holiday habits, the amount of public and religious holidays). In this context, this part of the study will focus on economic factors. Income level is the most influential factor in demand, and income elasticity of demand is often greater than price elasticity. As a result, if the income level of people cannot be raised sufficiently, lowering the price after a certain point will not be enough to increase the demand. However, it is assumed that as the income level of people increases, their travel demand will also increase. There is a strong relationship between GDP and the amount of airline production and consumption in the world. In other words, if the products and services produced in a country or worldwide increase, the demand for air transportation will also increase (Odoni, 2009: 41). As disposable income increases, so does the demand for more expensive and long-distance routes. But, Doğanis (2006: 84) stated that as people's incomes fall, air transport will be seen as a luxury and will not be preferred. In other words, the flexibility of long-distance routes is higher than that of short-distance

routes, and the elasticity of demand income is lower for business travelers than leisure travelers.

2.1.3. Low-Cost Carriers

Many people take a vacation at least once a year. For this reason, low-cost air transportation is important for all people to reach (Sarilgan, 2016: 176). Airline companies also contribute to tourism. For example; hotels, restaurants and many other facilities benefit from air transport. Low cost carriers (LCC); It is defined as increasing the seat occupancy rates by reducing the costs of companies. In this context, low-cost carriers continue to be a major force in the metropolitan market, with 11% in 2015 and 10% in 2014, showing that air traffic is four times higher than all passenger transport. Market share in 2015 covered 29% of global traffic and 27% in 2014, or 42.8 million passengers. Low-cost carriers generally have lower ticket distribution costs, a homogeneous fleet, increased aircraft operations, use of secondary airports, and point-to-point connections (non-stop flights) (Fu, et al., 2010: 385). In addition, a minimum of service is provided on board and a meal fee is paid. Traditional carriers have responded in a variety of ways to the arrival of low-cost airlines. Some created their own lines at low cost but without meeting the hope of success. Others have tried to reduce their costs (by limiting in-flight catering, charging for luggage, and redeveloping access to entertainment and the interior of the aircraft) and efficiency by mimicking new competitors. 2016 TBC group (from 46 airports hosting the easyJet group (easyJet UK, easyJet Switzerland), Ryanair, Vueling, Transavia group (Transavia Netherlands, Transavia France), Norwegian, Flybe (UK), Germanwings Eurowings (including airlines such as Germany) , Wizzair (Hungary), Pegasus (Turkey), Volotea (Spain), Air Berlin group (Air Berlin, Niki), TUIfly (Germany), Jet2.com (UK), Iberia Express, Iceland Express WOW, Travels Services Smartwings (Czech), XL Airways) traffic, the

year was generally favorable for a large number of airports, but the traffic of smaller airports heavily dependent on TBC showed signs of contraction, mainly due to traffic recorded by Ryanair. According to the statistics; A number of airports with more than 10,000 passengers did not have TBC traffic in 2016. In this context, there are many reasons why the profitability of airline companies decreased (Morrell, 2005: 303).

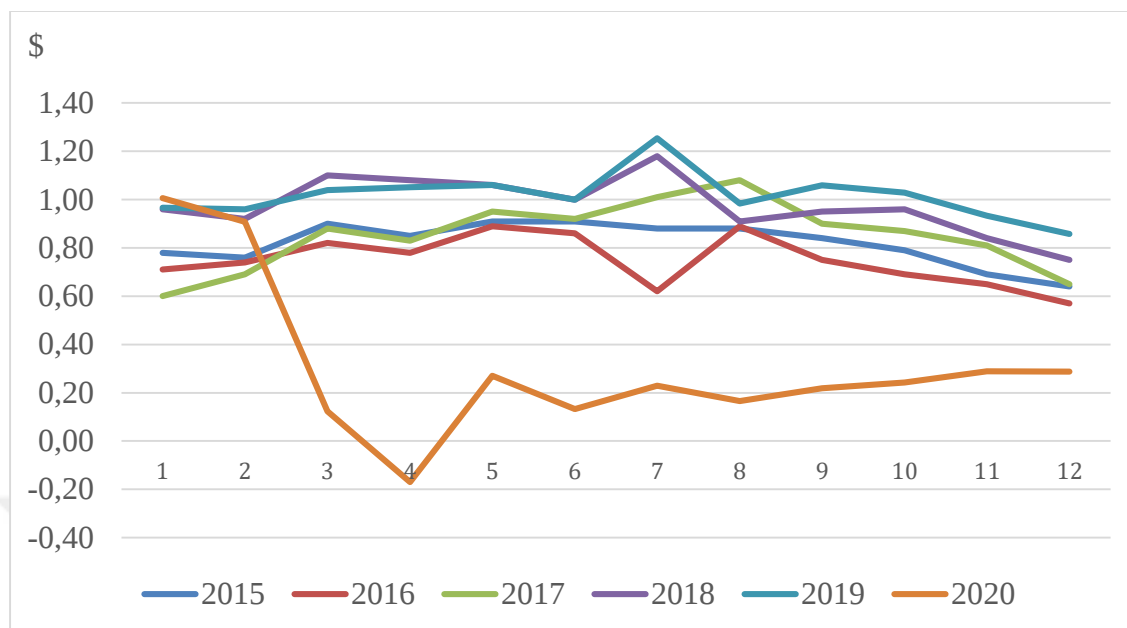
Doganis and O'Connell (2011: 400) complained of poor performance of airlines, often due to external factors such as oil prices, airport charges and terrorist attacks on countries. However, the industry is in a state of common instability due to the permanent overload factor (overcapacity). This is due to factors such as public policies and the readiness of new aircraft (the government usually guarantees an export credit).

Low cost carrier airlines offer low fares to passengers by eliminating some of the general luxury services. Therefore, by focusing solely on flight services, they provide only the services that are required to their customers. Therefore, passengers pay extra for extra services such as luggage, food and beverages if they wish. Generally, seats are narrow, personnel costs are low, aircraft maintenance, catering and ground services are provided by contract companies. Despite all this, they serve many passengers around the world and own about 30% of the market. In addition, they apply different methods to reduce their operational costs. For example; They pay less commission to brokerage companies for ticketing and instead; They are developing electronic documents for travel. Policies to reorganize business management processes are followed by LCC companies, with a uniform seating class (such as without business class), efficient use of a small number of employees, lower personnel wages, and reorganization of business management processes. Although these companies are mostly suitable for short-haul flights, there are also companies that implement this service for long-haul flights.

However, food and beverage and other services are offered at an extra fee (Sarılğan 2016: 176-177).

In addition to the stated characteristics of low-cost air transport, more than half of the experienced employees providing this service have been transferred from other sectors. Other airport employees (especially flight attendants and technical personnel) consist of low-income markets, students, blue-collar workers, farmers, and people who have never flown before. In summary, the most important factor that enables the development of low-tariff aviation services during the economic crisis is that the Turkish civil aviation sector has received a greater share from the market in the last decade (Tanrısevdi and Çulha, 2010: 69). Despite diminishing purchasing power due to economic crises, customers have an important share in the development of low-cost airlines. In addition, government support is also provided to this sector through established collaborations and partnerships. The main reason for choosing low cost carrier service is low cost apps. In addition, it has been understood that payment facilities, timely departure and non-stop flight features are becoming more common. It is observed that the demographic characteristics of the customers who benefit from the LCC service are not homogeneous in terms of profession, income, age and educational status (Dostaler and Flouris, 2006: 33).

In Turkey, low-cost airlines first started to serve only tour operators, and their flight routes included only international routes. Airline companies such as Anadolujet and Pegasus, which emerged as low-cost, made significant contributions to Turkish tourism. At the same time, low-cost carrier passengers have spent billions of dollars domestically. Thus, the seat capacity in the aviation sector has also increased, thanks to the cheap prices of aircraft services. For example; The number of tourists in Mardin increased by 3333% from 2002 to 2012 (Sarılğan 2016: 177).

Figure 2*2015-2020 Turkish Airlines Turnover (in million \$)*

Source: Turkish Airlines [THY], (2021).

The airline industry is affected by external and internal factors. Doganis and O'Connell (2011: 400) unlike; As can be seen in Graph-2, they stated that the influence of external factors in Turkey is enormous, and that internal factors mostly affect the airline sector and government policies related to finance, such as the purchase of new aircraft. The biggest difference in Turkey occurred in September 2017-2016. With the great impact of the coup attempt in July 2016, the total turnover in 2017 increased from an average of 630 million to 1 billion. According to the statement made by the Public Disclosure Platform (KAP, 2017); THY recorded a total of 7.2 million passengers in July 2017, with an increase from 5.8 million to 24.3 percent in 2016. Domestic flights increased by 26.8% and international flights by 22.5%. Paid Passenger Mileage (RPK), which was 11.6 billion in July 2016, increased by 19.6 percent in the same period of 2017 and reached 13.9 billion. The rate of increase in RPK was 25.8 percent in domestic lines and 18.6 percent in international lines. The number of passengers

transferred from outside to abroad (passengers coming from international lines and continuing to international flights increased by 8.9 percent. Meanwhile, cargo shipments increased by around 70,000 tons to 99,013 tons (39.5% compared to the previous year). Additionally, considering the regional Paid Passenger Km (PRK), it increased by 13.6% in the Far East, 17% in Africa and 30% in the Middle East. According to Abate (2016: 327), passenger load factor increased by 11.2% in the Far East, 15.6% in the Middle East and 8.6% in North America. It is possible to say that the number of passengers increased by 15.8% in the Far East, 19.5% in Africa, 30.5% in the Middle East and 27.6% in domestic flights.

To the Public Disclosure Platform (KAP, 2017) According to the company's operating profit was \$ 17 million in the first half of the year, it was \$ 189 million in the second quarter of 2017, and the company's second quarter loss decreased from 656 million lira to 194 million lira. Airlines reach their highest profit rate and higher ticket prices in the third quarter, corresponding to the summer season. Passenger revenues increased by 5 percent compared to the same period of 2016 and reached 2.2 billion dollars, and cargo revenues increased by 29 percent to 327 million dollars. Total revenues increased by 7 percent and reached \$ 2.6 billion, so in the first half of 2017, \$ 4.6 billion was generated. It is possible to analyze the effect of weather conditions on THY turnover. According to Turkish Airlines financial data (2018), the total turnover of January 2018 sales increased 605 million to 958 million dollars (as compared to 2017) (approx.58%). The General Directorate of Meteorology (2018) stated that snowfall decreased in Turkey compared to 2017. Compared to January 2017, snowfall decreased by 29% -32%. Therefore, , it is possible to say that weather conditions affect the aviation industry economically.

The highest increase in the number of passengers transported by air in January 2018 occurred in the last 12 years. "14 million 758 thousand passengers were served in January" and according to increase, the number of aircraft taking off from and landing at airports increased by 16.2 percent on domestic flights and 11.8 percent on international flights compared to the same month of the previous year. At the same time, "Domestic passenger traffic at the general airports of Turkey increased by 28.2 percent in January. When looking at the total passenger traffic in the same month of 2017, direct transit passenger increased by 28.5 percent. Thus, the highest passenger traffic compared to the last 12 years occurred in January 2018 (Türk Hava Yolları, 2019).

2.1.4. Oil Prices and Air Transport Relationship

Air freight services are also affected by world Brent oil prices Goyal and Negi (2014: 297) stated that the civil air transport industry was also affected by oil prices. The rapid increase in fuel cost caused net profits to decline in 2008, and operating costs increased due to high fuel costs. When companies started to have difficulties in importing oil between 2007 and 2008, they started to face the effects of the crisis. The oil crisis in early 2008 caused many anxiety blows. The bankruptcy of several airline repair companies, the withdrawal of planes and job losses have become core issues in the industry. The era of abundant and cheap oil is especially important for oil producing companies. For example; Oil prices were increased from 50 dollars to 140 dollars, but this increase was not only an element of the crisis, but also forced the situation of the global crisis.

Khan and Johri (2014: 92) argued that the spread of terrorist attacks, as well as other diseases, affected the airline industry economically. As terrorist attacks,

epidemics and pandemics also affect the aviation industry. H1N1, a type of flu, is a highly contagious viral infection that can be given as an example of epidemics.

This virus has affected large parts of the world, including the USA, Norway, the Middle East, Europe and Bulgaria. Thus, the virus affected many people and caused a decrease in the number of PAX (passengers) in the airline industry (Opera, M. 2010: 54).



Table 3

OPEC (Organization of Petroleum Exporting Countries) Annual Average Crude Oil Prices in Dollars and Aviation Industry Net Profit And Fuel Costs (2010-2019)

Year	USD	Net Profit in Billion Dollars	Total Industrial Fuel Costs, billion dollars
2010	77.38	17,3	0
2011	107.46	8,3	22
2012	109.45	9,2	41
2013	105.87	10,7	42
2014	96.29	13,8	40
2015	49.49	36	15
2016	40.76	34,2	-10
2017	52.51	37,6	-0,5
2018	69.78	27,3	15
2019	56,99	25,9	20

Source: Sönnichsen, (2019); IATA, (2019)

Fuel prices are the most effective cost factor for airlines. Since it changes over time, airlines have difficulty in predicting. OPEC's aim is to regulate oil prices for its members (Arıkan, 1998: 53).

Aviation sector net profit is obtained by deducting expenses from the total sales amount. Therefore, if the fuel cost increases, the net profit of the sector decreases. In this context, there are many factors that affect airline fuel costs. The market balance determining the optimum price also draws attention. Fully external factors and the economic crisis cause fuel prices to fluctuate. Airlines need to invest in technology and make improvements to reduce fuel consumption. These improvements provide advantages to the economy of airlines and are also good for the environment (Ateş, et al., 2018: 109).

2.2. Aviation Sector in Turkey

2.2.1. Aviation Sector's Contribution to GDP

The aviation industry has a large economic contribution to the economy. It provides the world's most important transport network, essential for global trade and tourism. According to the Oxford Economics Report (2011) report, industry has a direct, indirect and induced effect on the economy. First, aviation economy is related to cargo, passenger transportation and aircraft maintenance within itself. Indirect and induced impacts are related to other related sectors (oil suppliers, food, beverage and airline companies). The aviation sector employs approximately 204 thousand people annually and contributes to the Turkish economy with a tax payment of 946 million TL. Airlines carried 43 million passengers a year in 2011, and the aviation industry's contribution to GDP is approximately 10.4 billion TL. This represents 1.1% of GDP. After years of loss of many companies, the industry is now reviving itself and as a result, this contribution is expected to increase even more. Indirect taxation of the aviation industry's supply chains resulted in 819 million TL taxation. As a result, it is expected that an additional 1.2 million TL of public revenue will be obtained from the channels through both the aviation sector's own expenditures and the supply chain. IATA (2018) also states that 1 million jobs were created through air transport and tourism by air. The passengers who benefit most from air transport are the shippers and their business operators.

Mukkala and Tervo (2013: 1509) stated that a stable economic development, the gradual elimination of foreign trade imbalances and a more balanced growth provide support for the economy to successfully overcome the difficulties. According to Iskan

and Klaus (2013: 50), importance should be given to access to large population centers and markets, especially through air service, for economic development

According to the latest available data; The share of Low Cost Airlines has increased to 20% for domestic flights and 53% for international flights in Turkey. The largest LCC firm is Pegasus, located on the Asian side of Istanbul in Turkey. Atlasjet and SunExpress (50% of the company is owned by Turkish Airlines) rank second and third in this segment (Centre for Aviation [CAPA], 2018).

Figure 3

GDP (Gross Domestic Product) growth rate between 2003 and 2020 in Turkey



Source: World Bank [WB], 2021)

GDP growth rate measures how fast the economy is developing. İnal (2018: 16) stated that it is important to look at GDP in terms of evaluating a country's economy. By looking at GDP, it is possible to analyze both the growth rate and the ratio of production to the population. The average growth rate of real GDP in Turkey was 5% between 2003 and 2012. Although Turkey's real GDP growth in 2009 was negative, the growth in the number of PAX (passengers) was positively affected. Passenger growth rose to 10% in 2012, although GDP growth turned negative (1.9%).

Turkey's statistical reports show that employment figures rose by about 200% between 2003 and 2015. For example; The civil aviation sector provided direct employment to 65 thousand people at the beginning of 2003, and created employment for 91 thousand people in 2015. With the opening of Istanbul New Airport, it is estimated that the direct and indirect contribution of the sector to the employment will reach approximately 225 thousand people and the growth in the aviation industry will increase within 15 years. Global employment expectations are also expected to reach 100 million people by 2034 (Macit and Göçer, 2018: 53).

Tenant (2017: 211) highlighted the relationship between air transport and economic growth. For example; As people's income increases, the amount of demand increases. Aviation investments also contribute to a country's economy. Therefore, the relationship between air transport and GDP growth should be examined. However, articles on the relationship between aviation and GDP in Turkey are quite limited.

2.2.2. Cargo Transportation in Airlines

In recent years, the demand for cargo has started to increase. Goyal and Negi (2014: 298) emphasized that air transport and economy of all countries are interdependent. For example; civil aviation is affected by global economic recessions and therefore the demand for air transport is cyclical. Between 2009 and 2008, there was a significant movement in both passenger revenues and cargo transportation demand. Freight Ton-Kilometer (FTK) measures cargo traffic and expresses how much shipping work an airline takes. Total carried weight is not a clear measurement since the distance is important. For example; Providing a transport service of 10,000 kilometers per ton is a better transport service than carrying a tonne of 100 kilometers. Passenger RPK, measurement of the volume of passengers carried by an airline is referred to as "Revenue Passenger Kilometers". In addition, many major airlines

reduced their capacity during the global economic recession and canceled many new aircraft orders. Therefore, to deal with the economic crisis; companies halted new growth plans and reduced their seat capacities.

Air cargo has an enormous economic scale on the economy of the country in the export or import of goods. Arslan (2018) stated that the freight, cargo, mail and baggage traffic in Turkey reached 76,338 tons with an increase of 23.3 percent in domestic lines and 184,30 tons with an increase of 29.7 percent in international flights. In total; The reported increase in freight transportation reached 260 thousand 368 tons with 27.7 percent. Minister Arslan stated that the most important contribution to the increase in the number of passengers and cargo in January was provided by Istanbul Atatürk, Istanbul Sabiha Gökçen and Ankara Esenboğa airports. It is possible to measure the load carrying performance with Cargo Ton Kilometer. Unless there is a global crisis, the number of passengers traveling by plane is expected to increase strongly in the coming years. It is thought that the increase in air cargo transportation will increase at a certain rate.

Kasarda and Green, (2005: 460); They stated that in order to calculate the economic value of airline services, the profitability, customer satisfaction levels and quality of air services should be investigated at an international level and their statistics should be taken into account. Fu, et al., (2010: 26) stated in their study that it would be useful to examine the travels provided by the airlines and the supply chain to the economy in the field of trade and tourism in order to measure the impact of air transportation on the economy.

World trade is heavily dependent on air cargo services - Firms aiming to reduce inventory costs and adopt just-in-time production philosophy use air cargo logistics as a way to transport their products in the fastest and most reliable way. In markets where

the life of products is short, the fastest way to deliver products to meet the needs and preferences of customers is air cargo (Ozcan, 2014: 146).

The reduced costs as a result of liberalization and technological progress make air cargo logistics more attractive. As firms shift their manufacturing facilities abroad, where lower labor costs create a competitive advantage, they are more confident in air cargo logistics (Alkaabi and Debbage, 2007: 122).

2.2.3. Relationship between Passenger and Cargo Transport in Air Transport

Air transport is not the product carried by airplanes, but passengers are also air freight transported from one destination to another. Therefore, the capacity of the passengers carried and the cargo carried under the deck of the aircraft and the passenger carrying capacity should be managed in a planned manner (Gerede, 2010: 81).

To give an example from India, another country for air transportation; It had 1.5 million tons of cargo transported between 2009-2010, 400,000 tons of which were in the domestic market. The lack of a wide variety of infrastructures (connection with other modes of transport) is expressed as a handicap. Therefore, international traffic is concentrated at two entry airports such as Mumbai and Delhi. There is also a constant development in other cities of India such as Chennai, Bangalore and Calcutta. As a result, Turkey has been an important place in terms of cargo in recent years. Barbot, et al., (2008: 271) argued that cargo transportation has increased in the aviation industry. Most of the valuables are transported by aircraft and thus time and speed of delivery are also important. In times of economic crisis; Air cargo transportation is decreasing due to the decrease in consumption. Increase in oil prices also negatively affects air cargo transportation. If this demand decreases, air transportation will also be affected. Freight transport contributes to a country's economy.

2.3. Crisis Period Of The Air Transport Sector

The global economic crisis in 2008 had an impact on many sectors. Goyal and Negi (2014: 298), analyzing the economic crisis in the airline industry, they noted that economic growth was mostly dependent on people's disposable income (income after deducting taxes and social security fees). So after this increase, people tend to spend their money on air travel. Therefore, the civil aviation sector is important for the growth rate of a country and creates about 35 million jobs for people worldwide. It also contributes to a country's GDP. However, the 2008 crisis has also greatly affected the aviation industry. Another example is the September 11 attack, which caused the collapse of air traffic and economic activities of aviation. After this event, economies went into recession and employment was negatively affected. In addition, the economic crisis had side effects in the aviation industry. For example; airport ground handling and aircraft parts manufacturers have had to reduce their worker capacities, and people have begun to travel to short and inexpensive places. Hence, the profit of low cost carriers (LCC) has also increased due to demand. The airport industry is mainly affected by manufacturers, passengers, shipping, airports and services, aviation services, governments and airport transportation (Alamdari and Fagan, 2005: 378). Goyal and Negi also talked about the impact of the crisis on GDP. The magnitude of economic activities is determined by the parameter Gross Domestic Product (GDP), which is used to measure the total amount of production in a country over a period of time. There is a strong correlation between GDP and worldwide airline production and consumption. Therefore, the global crisis has had significant effects on the civil aviation economy. It has been stated that the estimated damage is approximately US \$ 3.5 trillion, corresponding to 7.5% of world GDP in 2001. In this context, the global economic crisis caused a decrease in demand in the civil aviation industry, decrease in

capacity, increase in fuel and operating costs, decrease in profitability, increase in employment level and low-tariff airlines (Alves and Barbot, 2007: 118). According to Artar, et al. (2016: 143) globalization and competition; It affects the transportation sector, which is an inevitable result of the natural effects of the developments in economic activities in many countries, the investments made and the profitability rates.

Ozguven, (2008: 653) argued that 2008 was a remarkable year for the global aviation industry with the advent of the economic and financial crisis. While the aircraft orders recorded by the world aviation duo "Boeing and Airbus companies" reached 2,754 in 2007, approximately 1,500 orders were placed in 2008. However, many airlines from the Middle East and China canceled their orders to both aircraft manufacturers, and leasing companies also faced financial difficulties due to the global crisis. Despite the significant impact of the global economic and financial crisis on the flow of air transport in general and the activities of airlines in particular, major aircraft manufacturers managed to deliver much more aircraft in 2009 than in 2008. 950 aircraft were delivered to airlines in 2009: Airbus delivered 498 aircraft in 2009, achieving the record of 483 aircraft delivered in 2008, ranking in the world for the seventh time in a row (Bieger and Wittmer, 2006: 41). Indeed, faced with requests by companies to delay deliveries, the global aviation duo has mastered the management of the reserve by allocating deliveries to several companies to limit risks and targeting companies whose deliveries are scheduled later for each aircraft carried forward. On the other hand, after excessive order picking, the number of order contracts decreased in 2009 due to the airlines' lack of vision for the future. At the end of 2009, orders for 111 aircraft from Airbus and Boeing aircraft were canceled. Although the aviation sector survived well with a growth of 2% in 2009, it experienced a decline in 2010 and the majority of the

sector aimed to come out of the crisis with minimum damage in 2012 (Barbot, 2006: 200). Airlines need to work on long cycles to resist the crisis better than other industries, but they need more time to get out of the crisis due to several factors that can be summarized as follows: Decreased aircraft deliveries, orders not returning to pre-crisis levels, and passenger and freight traffic are trying to recover under the impact of the debt crisis and the slowdown in the US economy. At the same time, the demand for private jets decreased and this type of transportation had a very bad image after the crisis (Domanico, 2007: 222).

2.3.1. The Effects of the Crisis on Employment in the Aviation Sector

Air transport is also affected by the economic crisis. Airline companies' main revenues come from tickets and cargo. In 2008, the total airline's net profit and profit margins also negatively affected employment. The increasing share of low-cost carriers and technology has led to the layoffs of workers. Many major airlines, such as United airlines, American airlines and Delta airlines, reduced their working capacity during the 2008 and 2009 crises and preferred their employees for unpaid leave. For example, employees in India were offered one month of unpaid work, and Japanese airlines also asked their workers to work for two months without pay. In addition, the number of Low Cost Airlines has been increased and only basic services have been provided to passengers at low fares. For this reason, it has taken customers of premium airlines, thus providing new demand in the world economy. To deal with Low Cost Airlines; Airline companies providing luxury services have begun to reduce food service and charge extra luggage. It has been explained that employment and air transport are interrelated during the crisis period (Haanappel, 2001: 100). For these reasons, according to Fu et al. (2010: 26) Saving measures should be taken in times of crisis in the economy.

The economic crisis caused a decline in both employment and the supply of air transport. In 2009, layoffs Macário and Voorde, (2009: 31) in the table below.

Table 4

Layoffs in the Aviation Sector

Carrier	History	Layoffs
Scandinavian Airlines (SAS)	February 4, 2009	8,600 out of 23,000
Boeing	August 12, 2009	Additional 1,500 layoffs
Virgin Atlantic	January 10, 2009	4500 Employees
Ryanair	February 12,	600 out of 9,000
Air France / KLM	February 12,	200 staff
Lufthansa	April 15, 2009	3,000 out of 100,000
Aeroflot	July 16, 2009	400 administrative staff
LOT (Polish Airlines)	September 17,	2000 staff
British Airlines	October 6, 2009	400 out of 3,500
Aer lingus	October 6, 2009	1,700 of the 14,000 cabin crews
	October 7, 2009	676 out of 3,900 (over the next two

Source: (Macario and Voorde, 2009: 32).

Scandinavian Airlines includes Denmark, Norway and Sweden and has the highest layoff rate (44%). However, if we take the percentage of layoffs, Air France has the lowest score.

Table 5

Airline Companies' Percentage of Layoffs (Total Employees / Layoffs in 2009)

Airline Companies	Total	Layoffs	%
SAS	23000	10100	44%
Ryanair	9000	600	7%
Air France	100000	3000	3%
LOT Polish Airlines	3500	400	11%
British Airlines	14000	1700	12%
Aer lingus	3900	676	17%

Source: (Macario and Voorde, 2009: 34).

Some airlines were deeply affected by the economic crisis, while others were not. IATA, (2013: 11) argued that the global crisis had less impact on Romanian airlines. The reason is that the effect of the economic recession was shown in Eastern Europe after a while. Subsequently, the crisis affected many charter flights in the country.

Charter flights are defined as the use of travel agencies by chartering and are generally preferred during the periods when scheduled flights are intense. These flights decreased by about 30% and also RPK decreased. Another point is that the LCC (low cost carriers) went bankrupt, such as Italian companies and Austro-Slovakia companies that also showed the impact of the crisis. In addition, the crisis of the aviation economy has indirectly affected the tourism sector as it prevents people from traveling to other countries. As a result, aviation companies had to reduce the number of employees and caused unemployment in the tourism sector. Therefore, to deal with the crisis (IATA, 2013: 13) Other business models such as commercialization, pushing technological change, airline networks, and high-speed trains have been put forward.

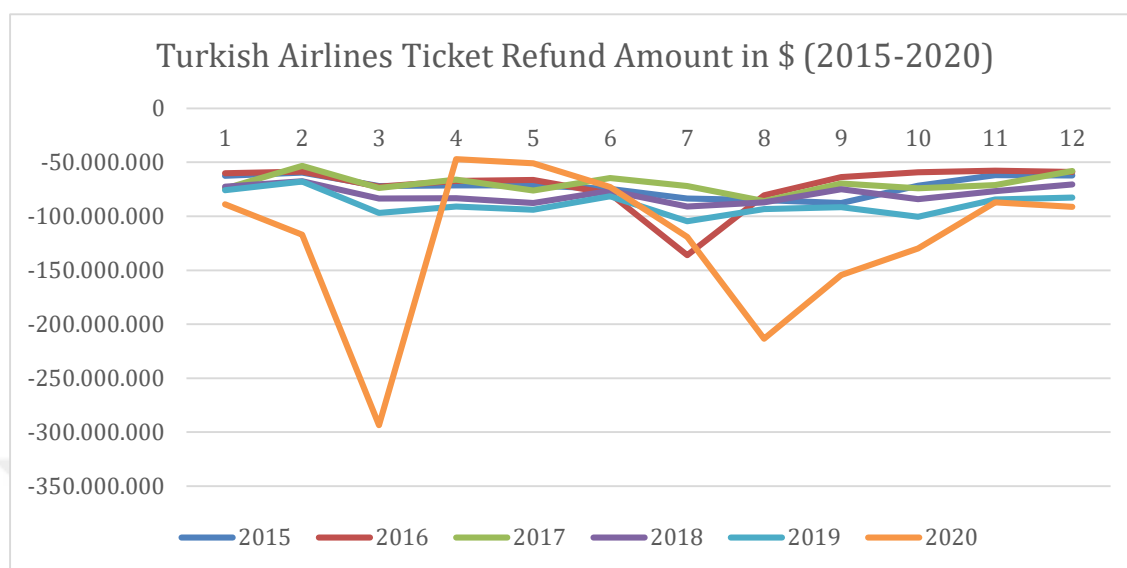
Küçükönel and Sedefoğlu (2017: 17) stated that air transport facilitates tourism and trade, causing economic growth, providing job opportunities, improving living standards and alleviating poverty, and increasing revenues from taxes. It is not strategically important to carry out studies to develop demand forecasts by making the right planning in order to allow the healthy development of the air transport sector, which survived the global financial crisis.

Kasarda, (1991: 188) stated that areas with access to the airline services network will have a competitive advantage over those without accessibility, and the availability of airfreight services can enable regions to create more jobs, especially those with industries and professions that are more dependent on services.

2.3.2. Aviation Sector Due to Terrorist Attacks in Turkey in 2016

Air traffic in Turkey also decreased due to the July 15 coup attempt, and the impact of the decrease in airports located in Turkey's tourism destinations was affected by the others. According to the data of the General Directorate of State Airports Authority, DHMI (2019), the number of passengers receiving service from the airports

decreased by 16.1% in July and the number of Pax (passengers) reached 17.028 million. In the first 7 months, the number of passengers decreased by 2.9% and the number of passengers reached 97 million 600 thousand. According to the data of the Authority, the number of passengers using Istanbul Atatürk Airport in July decreased by 1 percent compared to the same period of the previous year. SAW (Istanbul Sabiha Gökçen Airport) was not adversely affected by the coup attempt. On the contrary; The number of passengers increased by 9% in July. At the same time, tourist centers are much more affected. For example, the number of ADB (Izmir Adnan Menderes Airport) international passengers has decreased by 19%. The decrease in the number of international passengers in AYT (Antalya Airport) was 48%, and GZP (Gazipaşa Airport) was 38%. According to DHMI (2019) data, the number of international passengers at DLM (Dalaman Airport) decreased by 43% to 921 thousand 129 in July, while the number of international passengers at BJV (Bodrum Airport) decreased by 41%. For this reason, terrorism and the coup attempt affected the tourism industry for a short time. However, by distributing the perception that these effects are permanent on the aviation sector in Turkey, the high demand in Turkey has started to increase again (Welle, 2017).

Figure 4*Turkish Airlines Ticket Refunds between 2015-2020*

Source: Turkish Airlines ([THY] , 2021)

As seen in Figure-4, the highest repayment was made in July 2016 except pandemic time, with approximately \$ 136 million. Refunds have increased due to the terrorist attack on Atatürk Airport and the military coup attempt against Turkey. The refund amounts in September 2015 and August 2017 are due to the high season because the number of the most sold tickets in a year was in those months. As a result, it is possible to say that external factors are directly proportional to the number of tickets sold.

2.3.3. Indian Economic Crisis and Aviation Sector

The economic crisis has led to deep recessions in many countries and even developed economies have suffered. Uysal, (2019: 237) stated that the growth of the latest economic data for India would rise to 6.7% in 2008-2009 and government officials stated that India should rapidly gain a "growth momentum in the range of 8.5% -9% per year". However, India did not escape some of the consequences of the crisis, unemployment reached nearly one million and exports of goods fell by about 33.2%

between April 2008 and April 2009. Meanwhile, gross domestic product (GDP) has continued to grow and the government has survived the hardest part. The most dramatic reform has been accomplished with the opening up of the Indian economy to the outside world. They also participated in certain sectors such as insurance, defense industry, printing and civil aviation. Thus, significant progress has been made in some sectors such as civil aviation and telecommunications (Korul and Küçükönel, 2003: 32). The domestic civil aviation air market is fully competitive, and private companies have evolved with an incomparably better level of service than the two former public monopolies, Air India and Indian Airways, before the global crisis. However, India's GDP per capita in 2008 was \$ 1,016 at nominal value and slightly higher than that of Africa, with purchasing power \$ 2,762. Nominal GDP measures the value of all final goods and services produced within the borders of a country over the market prices of the period in which they are produced (Gökırmak, 2014: 21).

High operating costs and declining growth rate have heightened the aviation industry crisis in India. Khan and Johri (2014: 93) stated that many large financial institutions caused a global financial crisis and the aviation economy was the most affected by the crisis. In 2003 there were only four aviation companies in India, but in 2012 this number increased to eight. Difficulties have been experienced in dealing with the crisis, except for some airlines that invested heavily in the growth phase. The reasons for this are the reduction of their fleets and manpower, and the redevelopment of their programs and services. Costs are high due to India's high fuel prices and airport taxes and irregular airport infrastructure (Gillen and Lall, 2004: 48).

Indian companies received financial markets or government aid for the aviation economy between 2009 and 2012. In a price-decisive market, low-cost development has also become an alternative strategy, accounting for about 65% of. It ranges from 90.4%

for Indigo and 77% for Go Air (India-based airlines) (Huettinger, 2006: 228). Additionally; Khan and Johri (2014: 89) They analyzed the effects of the GFC (global financial crisis) on "Air India's Financial Performance" and stated that the GFC affected expenses and revenues. Therefore, Air India's gains and losses are analyzed. As a result, they hypothesized that fuel prices do not affect the GFC, Air India employees' payment, repair, communication and increase in operating expenses. PRK (passenger income) was also included in the hypothesis, data used from reliable websites, magazines, as well as Air India's 2007-2014 financial reports. Later, they used a multiple regression model with SPSS and explained the dependent variable as the financial performance of Air India, expressing income before tax and interest. In this context, they implemented the model and found that the adjusted r^2 was 95%, which means the model has very high reliability (Hunter, 2006: 317). As a result, they found that fuel prices had no effect and that the payments made to employees were rejected by the hypotheses. On the other hand, it is accepted that there is no effect of expenses and the effect of Pax (passenger) revenues at the 5% confidence level. They found that passenger revenues were directly related to fuel prices in GFC 2007 and stated that the payments made to employees in the global crisis were also affected. Companies had difficulties in paying their salaries, as the passenger demand was low, the revenues of the companies decreased and the aircraft occupancy rate decreased. Thus, the financial crisis and terrorist attacks caused a decrease in passenger revenues (Mason, 2001: 104).

2.3.4. Global Economic Crisis in Brazil

Entrepreneurs and the developing commercial aviation market in Brazil are trying to trace growth despite the global economic crisis. At Congonhas airport in Sao Paulo, the country's economic capital, 70 aircraft are on display at the annual Latin American Commercial Aviation Conference, showing the world's second largest aviation volume.

The commercial aviation market has grown enormously in Brazil, unlike other countries. Thus, from 2010 to 2011, the industry grew by 6.4% and contributed between 4.5% and 5% in the aviation economy. Brazil was not affected by the global crisis due to the entry of many companies into the country. According to the Brazilian General Aviation Association (ABAG); Brazil has the world's second largest general aviation fleet and 13,094 aircraft, including a region in Sao Paulo. In addition, there are 1,650 jets in the business jet segment because those who can afford it are those who choose the plane to escape chaotic car traffic (O'Connell and Williams, 2005: 270).

Khan and Johri (2014: 90) stated that many airline companies had difficulties due to the increase in oil prices to 140 dollars in 2008. But; Due to the high domestic demand in Brazil and China, these countries were not affected by the global economic crisis. Marazzo, et al., (2010: 262) analyzed the relationship between economic growth and air transport demand in Brazil using time series analysis, and the research findings showed that there is a strong relationship between the number of passengers and GDP. Therefore, it shows that the positive increase in the number of passengers has a positive effect on GDP. Using the Granger causality analysis method, the relationship between airline passenger traffic was investigated and the results of the study showed that there is one-way Granger causality from economic growth to airline passenger traffic.

Baker, et al., (2015: 148) also examined the cointegration and causality relationship between economic growth and aviation in Australia. They concluded that airports have an impact on economic development and have an impact on regional air transport.

2.3.5. United States September 11, 2001 Crisis

The terrorist attacks of 11 September 2001 had many negative consequences on air transport. The United States of America has severely interrupted international flights with its decision and had to close its airspace for a week. According to the Massachusetts Institute of Technology Global Airline Industry Program (2012); In 2001 and 2002, available seat kilometers (number of seats offered x miles traveled) decreased by 15 percent on transatlantic (crossing the Atlantic) and transpacific (crossing the pacific ocean) routes, further reducing US carriers capacity. (International Labor Office, 2002) In Europe, airlines announced plans to lay off 30,000 jobs, accounting for 10 percent of their workforce, and North American airlines laid off 95,000 jobs (20 percent of the workforce). These layoffs have also affected ground handlers and aircraft manufacturers Boeing and Airbus. In addition, catering businesses and car rental agencies at airports suffered. Aircraft orders were also canceled due to this crisis. For example; Customers reduced their orders from 1803 aircraft to 816 in 2001, and two major aircraft leasing companies, GE Capital Aviation Services (GECAS) and International Lease Finance Corporation (ILFC), had to reduce their financial support rates because the crisis also caused aircraft values to decline.

2.3.6. Severe Acute Respiratory Syndrome (SARS) Crises in the 2002-2003 Period

The economic crisis also has other effects on the aviation industry. Korul and Küçükönel (2003) stated that between 2002 and July 2003, the SARS (Acute Respiratory Syndrome) epidemic affected the air transport industry more than the September 11 attacks and the Iraq war combined. Air traffic decreased by 18% year-on-year in April 2003, particularly Asian airlines and airports in Hong Kong (China), Singapore and Seoul, where air traffic dropped by 40% to 60%. Cathay Pacific Airlines landed 22 of the 80 aircraft in its fleet, canceling 45% of the flights. The airline also

decided to close its headquarters in Vancouver, Canada, leaving 147 people unemployed.

2.3.7. Economic Crises in Aviation Sector in the Period of 2008-2009

If we look at the cyclical impact of the aviation industry; civil aviation suffered the most during the 2008 and 2009 economic crises. Harvey ve Turnbull (2009: 11) With 150 major airlines, job losses reached \$ 15 billion and 13 companies in the United States went into bankruptcy. Another example is the company from Scandinavian Airlines (SAS), which reduced its capacity the most with a 40 percent drop. The economic crisis has had various side effects on airline companies' staff. For this reason, Lufthansa had to reduce working hours in its transportation operations, and British Airways had to apply separately and implement a wage reduction and dismissal policies. Also in April 2010; The eruption of Eyjafjöll volcano in Iceland caused the worst civil aviation incident since the Second World War. In the week following the explosion, 100,000 flights were canceled, and for this week alone, it was reported to cost about \$ 4.7 billion worldwide, and the impact reached 10 million passengers. Following this event, the International Civil Aviation Organization (ICAO) established a volcano monitoring system in 2012 by establishing a working group that publishes practical tools.

Another example is from Geneva; Before the crisis, approximately 40,000 aircraft landed at the Geneva airport, while in 2007 the number of flights during the year decreased. Business aviation is particularly important in Switzerland. Haluk and Çelik, (2020: 226) argued that airline companies in Switzerland were losing power due to the crisis. But; In Zurich, the decline was more moderate and remained stable and even increased at the surrounding airports from Sion to the city of Bern. The number of commercial flights is increasing at an extraordinary rate. Coexisting on a single runway

for business and leisure purposes, Geneva has promoted mass market links for money matters, while the capitals have benefited from platforms dedicated to business aviation. Thus, each device pays a fee according to its weight. For example; a large car pays more and provides public services, but the airport is an "autonomous" (independent) public agency. The European Aviation Safety Agency (2008), an organization established for European aviation safety, initiated negotiations with national aviation authorities to assess the significance and consequences of the crisis that spread to all sectors of economic activity. Analysis of economic and financial statistics, as well as forecasts made by various aviation organizations, soon showed that this would be a major crisis for transportation and all related activities. Indeed, although the general trend was very optimistic at that time, figures show that the recovery will continue until mid-2009 and the economic crisis will continue at least until mid-2010. Since air transport is essentially dependent on the development of gross domestic product and taking into account past experiences, it was unacceptable that freight traffic (goods transported by aircraft) continued before the beginning of 2010 and passenger traffic did not start. Given the difficulty of easily adapting the proposal to move again on demand before mid-2010, it was stated that excessive capacity would create serious instability, possibly leading to industrial changes and even profound changes in policies implemented in the sector (İnan, 2020: 81).

Pearson and Merkert, (2014: 22) stated that airlines are experiencing economic difficulties, bankruptcies are expected and consolidation (support) of the sector is expected through strengthened agreements. The professional association has created a new wave of liberalization framework to facilitate their relocations by mergers and demanded the replacement of the reciprocal system with a multilateral approach that allows airlines to act like any other company in a competitive environment. In addition,

the circumstances affected the aircraft construction industry and aircraft orders were expected to be canceled. Therefore, they had to revise their production plans, which had consequences on employment. Yet at this point, Krawczyk and Philipp (2017: 44) they tended to have a slightly different view. The difficulties of European producers seemed to be due to the dollar discount rather than the crisis. They also stated that “under the pressure of customers of countries such as developing countries, relocation is already inevitable”. For example; India and China are very ambitious about the aviation industry. Therefore, country representatives and national authorities responsible for aviation safety were concerned about the consequences these tensions could have on their operations. Therefore, it was predicted that the crisis of companies may lead to a decrease in power efforts to maintain and improve aviation security. This is a trend that is always observed when a business is in a sensitive financial situation (Akar, Manga, & Bal, 2019: 1162). To prevent this from happening, the competent authorities need to take the necessary measures. The European Aviation Safety Agency (EASA) stated that it has completed the draft of the rules for the implementation of the regulation extending to all kinds of operations, whether commercial or not, and that they concern the activities of aircraft or other flying machines. In fact, even though the society regarding fidelity competition in the domestic market has adopted a regulation applicable to air passenger transport activities, its implementation raises many problems, especially for small companies. In addition, the complete development of a framework for a new community law is not suitable for other types of activities. Moreover, they came to the conclusion that some of the good aspects of this unfinished economic aviation crisis, which could create a new disappointment for airlines, lead to a new approach to how civil aviation will develop in the long run. This view mostly appeals to short-term solutions to minimize the effects of the crisis, and this activity,

which is so beneficial for trade and dialogue, ensures that the foundations of a future policy for sustainable development on a global scale are considered among the society (Pearson & Merkert, 2014: 22).

The aviation industry is one of the most important issues of globalization. For this reason, every factor that positively or negatively affects global economic developments is reflected in the aviation industry in a short time. A financial crisis, pandemic, or natural disaster can cause spikes in passengers and flights. For example; Acute respiratory failure in Southeast Asia caused a sharp decline in passenger numbers at this time. At the same time, the travel industry has been heavily affected. In addition, ground services companies and aviation industry sub-sector are affected because they are interrelated (Pantazis and Liefner, 2006: 268). Airline profits started to decline in 2008 due to the impact of the crisis. He supported American aviation and European aviation companies to demonstrate that the RPK (Revenue Passenger Kilometer), measured by multiplying the number of paid passengers and kilometers flown, decreased. This implies that the volume of passengers carried can be measured by an airline. Therefore, countries that are dependent on tourism are affected by this. Some of the countries most affected are the UK, USA and Spain. On the other hand, it affected Eastern European countries such as Poland, Portugal, Australia and Germany less because more emphasis was placed on low cost flights. For this reason, most of the aviation companies have started to address the crisis with promotions and low prices to reduce losses (Kassim and Stevens, 2010: 16).

During the global financial crisis, both passenger and cargo transportation dropped sharply (Pearson and Merkert, 2014: 23). In September 2008, he stated that airline companies' profits began to decline, causing flights to be canceled and aviation companies to layoffs. Passenger RPKs reduced premium fares and economy fares.

Higher fuel prices are also the most influential factor in the future. Therefore, he stated that some European countries were most affected by the crisis, while some did not feel the 2008 crisis. For example, Maxjet, the first European company to go bankrupt due to crises. They were operating in the business class segment between London, Las Vegas and New York. Another example is Eos Airlines, which went bankrupt in April 2008. A Spanish aviation company named Futura also went bankrupt, although it provided flight services at 28 airports in Spain, 118 airports in North Africa and Europe. Most aviation companies have suffered serious losses and different policies have been applied. For example; British Airways have supported their loyal customers even if they are not making a profit. LLC (low-cost) companies have taken advantage of crises to implement attack policies.

According to Celasun and Rodrik (1989: 618), the GFC (global financial crisis) caused economic uncertainty, it was difficult to pay employees due to the decrease in customer demands, there was a decrease in employment, and it also caused a decrease in the profitability of the airline industry. This contraction in the economy caused price competition among airlines, passengers started to travel less by plane, and many airlines suffered financial losses due to the increase in fuel prices. During the global financial crisis, significant decreases were experienced in income items across the country and economic growth slowed down. These trends were reinforced by the onset of the economic and financial crisis in 2008, forcing large global companies to reorient their strategies towards reducing costs, and as a result, increased outsourcing, especially in developing countries.

CHAPTER 3. DATA AND METHODOLOGY

In this section, research data, descriptive statistics, methodology and regression model will be covered.

3.1. Data

Table 6

Number of Passengers, Amount of Cargo Transported, Number of Arrivals and Departures

Variable Code	Variable name	Explanation	Source
GDP	GDP Growth rate%	GDP (current US\$) 1960- 2019 (%)	World Bank Data
PAX	Number of Passengers	Total number of passengers at airports in Turkey	Turkish Statistical Institute (TURKSTAT)
Cargo	Cargo carried in tons	Total cargo transported from airports	Turkish Statistical Institute (TURKSTAT)
Oil	Average annual oil price	OPEC crude oil price in dollars 1960- 2019	Statinvestor.com

There are 4 variables in this analysis. The data period is 1960-2019 The number of passengers, the amount of cargo carried, the number of landing and taking off aircraft are used by TURKSTAT (Turkish Statistical Institute). It was established as the "Central Statistics Council" in 1891 during the Ottoman period. In the Republic period; It was established on February 26, 1926 as the "Central Statistics Department". In 1930, all the duties of the department were reorganized and transformed into "Statistics General Directorate". The institution later took the name "State Institute of Statistics" in 1962. Finally, the name of today "Turkish Statistical Institute" was given in 2005. Briefly, it is a data collection agency that provides data on census, national income, Consumer Price Index, Producer Price Index and Inflation. Aircraft departure and

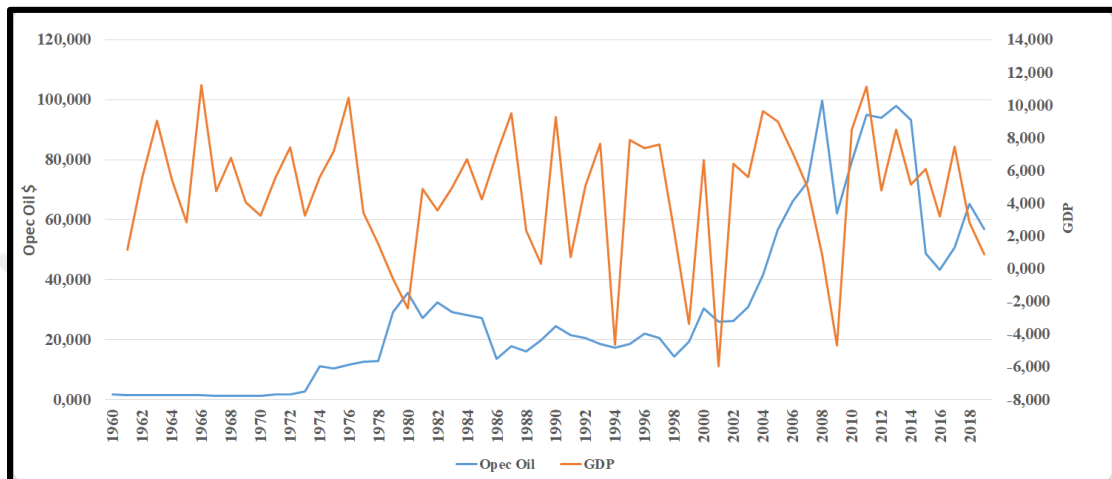
landing information is obtained from DHMI (General Directorate of State Airports Authority). It is a government-organized agency responsible for the regulation and control of traffic in Turkish airspace. DHMI was established in 1933 and has been operating as a state economic enterprise since 1984. Air traffic services, terminal and passenger services are also provided to foreign commercial airline companies. World Bank indicators are also used in the data. It is a large database containing the global economic collection of countries. Data for some countries is more than 50 years old. The database provides information on health, environmental, trade and population data. Open data is available to all people. You can choose time series, economy, and tables and graphs can be created. Data are also collected from their own surveys and mostly from international outsourcing survey companies or international statistical organizations. Annual growth rate of Gross Domestic Product is taken from World Bank deficit data. Moreover; Average annual oil prices between 1960 and 2019 are also used in the data StatInvestor, (2019). OPEC means the organization of the oil exporting countries. It was founded in Iraq in 1960. OPEC countries have two-thirds of the crude oil reserves and provide about half of the world's oil production (Altunöz, 2020: 61). The last variable, Prk, comes toll passenger mileage. It is calculated by multiplying the total paid passengers by the distance traveled. Financial reports for the years 2002-2019 are used. The latest available data are retrospective until 2002 (Turkish Airlines [THY], 2020).

3.2. Descriptive Statistics

Data on the relationship between GDP and oil price between 1960 and 2018 were taken from statinvestor.com and graphed.

Figure 5

GDP growth in USD (% per year) and Oil (Average Annual OPEC prices) 1960-2018 (StatInvestor, 2019).



Source: StatInvestor, (2019). (The table is made using the data of "statinvestor. com / data"),

Line graphs of GDP and oil prices are plotted against time on a yearly basis. This figure 5 shows that there is a relationship between GDP and oil price. Oil price is calculated based on Brent oil price.

3.3. Methodology

3.3.1. Purpose of the research

The aim of this study is to analyze the causal relationship between GDP and air transport indicators (the amount of cargo, the number of passengers carried and oil prices) between 1960-2019 in Turkey. In the analyzes applied, logarithms of the gross domestic product growth rate (GDP), the total number of passengers at the airports in Turkey (PAX), the amount of cargo carried in tons (cargo) and the average annual oil prices (OPEC) were used.

3.3.2. The Importance of Research

In this study, the relationship between GDP and air transport data in Turkey, the amount of cargo, the number of passengers carried and oil prices for the period 1960-2019 was analyzed around the Johansen Co-Integration Test and Granger Causality Test. In the applied analyzes; The logarithms of the gross domestic product growth rate, the total number of passengers at the airports in Turkey, the amount of cargo carried in tons (cargo) and the annual average oil prices are used.

It is of great importance for the sector to make correct predictions in order to enable the healthy development of the air transport sector, which is frequently faced with the global financial crisis. Airline transportation has important effects on countries in terms of both economic growth and financial development. A country with an aviation industry that is assertive in leadership; It can encourage participation in the world economy, provide competitive advantages and provide millions of job opportunities. In addition, air freight transport is one of the important modes of transport that provides the integration of international activities, removes barriers between economies and shortens distances in the most efficient way in terms of time. Economic activities shape investments, trade and transportation through logistics channels, which are an inevitable result of the acceleration of globalization, and naturally affect the developments in the countries. Air transportation and aviation investments are also thought to contribute to economic growth. For this reason, it has been observed that there are not many adequate empirical academic studies examining the relationship between economic activities and air transport. Therefore, it is thought that the analysis of the relationship between economic growth in Turkey and air transport in this study will contribute to researchers, readers and the relevant sector.

3.3.3. Data Analysis

In the analysis of the data in the research, causality analysis has been performed and a statistical hypothesis test is made whether one time series is useful in predicting another time series. The unit measures of the variables obtained as measurement data in the analyzes performed were calculated on the basis of GDP and oil prices in dollars, the number of passengers transported per person and the amount of cargo on tons. The data are from 1960 to 2019 and are for January 1 of each year. EViews 10 statistical program was used for all calculations and the results of all analyzes are given in Appendix B.

3.4. Regression Model

Regression models are mathematical equations on the dependent variable in which the effects of the independent variable or variables are shown (Korkmaz & Guney 2012: 16). In the study, it is aimed to investigate the effect of oil price, cargo amount and number of passengers on GDP. Therefore, GDP (Y) is the dependent variable and oil price (X1), cargo quantity (X2) and the number of passengers (X3) are selected as independent variables. In this context, if it is desired to be displayed on the model to be edited;

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \varepsilon_t$$

In this equation, t represents time. X_{1t} indicator X1 variable t. is its value over time. β_0 (i=0,1,2,3) values are regression coefficients. While β_0 is a constant coefficient, the coefficients of β_1 , β_2 and β_3 are the coefficients of variation of the variables X_1 , X_2 and X_3 , respectively. The ε_t value in the equation is the error term at time t. In this context, using the logarithms of the values of the variables in the analysis will make it easier to understand and interpret the predicted values of the model parameters. T indicates time. X_{1t} indicator of X_1 variable t. is its value in time. Take the

year 1960, for example, when $t = 1$. X_{1t} here shows the average OPEC oil price in 1960. Similarly, X_{2t} shows the amount of cargo transported in 1960.

Y_t The value of the dependent variable that is GDP (current US dollar)

β_0 regression constant.

β_1 coefficient of independent variables Average OPEC oil prices (\$)

β_2 the argument is the Cargo coefficient transported in Tonnes.

β_3 the independent variable is the total Passenger Count coefficient

The values of β_i ($i = 0,1,2,3$) in the equation are the regression coefficients. While β_0 is the constant coefficient, the coefficients β_1 , β_2 and β_3 are the change coefficients of the variables X_1 , X_2 and X_3 , respectively. Contained in the equation ε_t value is the error term at the t th time.

3.4.1. Stationarity Tests

It is of great importance that the series are stationary in models that examine time-dependent changes and relationships. Stationarity is the condition in which the mean, variance and autocorrelation of a random variable are constant. In other words, the series values of the variable converge to a fixed value or change around the expected value. In cases where stationarity cannot be achieved, the change will only be valid when the series is dealt with (Sincich, 1996: 519).

While designing the regression model, it was designed to examine the relationships between stationary variables. Therefore, it cannot be said that it is very healthy to make inferences from the results obtained from a regression model applied with non-stationary variables and to make a decision as a result of these analyzes (Emeç, 2010: 34- 36).

There are many methods used to test whether a series is stationary or not. In this study, whether the variables in the data set are stationary or not will be examined with

the help of the Augmented Dickey-Fuller unit root test (ADF). (Durağanlık dickey fuller, 2018)

Table 7

ADF Test Results

	ΔGDP	$\Delta CARGO$	ΔOIL	ΔPAX
t-Statistics	-10.3541	-8.0479	-8.0345	-8.0392
P values	0.0000	0.0000	0.0000	0.0000

Augmented Dickey-Fuller test (ADF) was applied to determine the unit root and stationarity. As a result of the calculations, analysis value is $p < 0.05$. That is, not all variables have a unit root and are stationary at the first difference level with constant terms. So we can say that the variables are cointegrated. This means there is a long-term balance that ties the series together over time.

3.4.2. Johansen Cointegration Test

After it is determined that the series are stationary at the same level and the number of Var delays is determined, cointegration test can be started. In the cointegration test, the number of cointegrated vectors does not change regardless of which variable in the model is made. Because, while finding the cointegrated vector, the model takes into account the relationship of all series to each other and presents a result that includes all variables. Level data are used in the Johansen cointegration test. The Johansen cointegration test reveals whether there is a cointegrated Vector Error Correction Model (VECM) among the variables included in the model (Kocabıyık, 2016: 47).

Table 8

Johansen Cointegration Test Results Unlimited Cointegration Ranking Test (Trace Value)

Number of Default Equations	Eigenvalue	Tracing Statistics	0.05 Critical value	Prob.***
None *	0.807615	131.7097	40.17493	0.0000
Up to 1 *	0.400454	41.05548	24.27596	0.0002
Up to 2 *	0.195968	12.91845	12.32090	0.0397
Up to 3 *	0.016624	0.922026	4.129906	0.3901

Trace test shows 3 equations cointegrating at 0.05 level

* Indicates that the 0.05 level equation is rejected.

** It indicates that the 0.05 level equation is accepted.

***MacKinnon-Haug-Michelis (1999) p-values (Prob)

Table 9

Unlimited Cointegration Rank Test (Maximum Eigenvalue)

Number of Default Equations	Eigenvalue	Max-Eigen Statistics	0.05 Critical value	Prob.***
None *	0.807615	90.65426	24.15921	0.0000
Up to 1 *	0.400454	28.13703	17.79730	0.0010
Up to 2 **	0.195968	11.99642	11.22480	0.0365
Up to 3 *	0.016624	0.922026	4.129906	0.3901

Maximum eigenvalue test shows 3 cointegrating equations at 0.05 level

* Indicates that the 0.05 level equation is rejected.

** It indicates that the 0.05 level equation is accepted.

***MacKinnon-Haug-Michelis (1999) p-values (Prob)

The trace values calculated as a result of the "Johansen Co-Integration Test" and the test statistics of the eigenvalue are calculated and the equations are tested according to the number of cointegrated equations in the "number of cointegration equations" section of the table. In the table "number of assumed equations column," in the first line "None/ There is no co-integrated equation between the series); in the second line "There is at most 1/ There is at most 1 cointegrating equation between the series); In the

third line, there are statements such as “There is at most 2/ There is at most 2 cointegrating equation between the series) and in the fourth line there are statements such as “There is at most 3/ There is at most 3 cointegrated equation between the series). In addition, the p values in this table; In cases where it is higher than the critical value ($p > 0.05$), the related equation is rejected and in cases where the P values are less than the critical value ($p < 0.05$), the related equation is accepted. If there is more than one critical value less than 0.05, then the equation with the largest p value is accepted. (Kocabiyik, 2016: 48).

Therefore, as a result of the Johansen cointegration test conducted for this study; the first of the equations is “1 at most”; the second equation is expressed as "2 at most" and the third equation as "3 at most". In this context; p-values of the equations; For “None” it was less than the critical value ($0.0000 < 0.05$), for “max 1” it was less than the critical value ($0.0010 < 0.05$), for “max 2” it was less than the critical value and “max 3” is greater than the critical value ($0.3901 < 0.05$). As a result; “none”, “Maximum 1”, “Maximum 2 equations are less than the critical value ($0.000 < 0.0010 < 0.0365 < p < 0.05$), the closest to the 0.05 critical value (Max. $2 = 0.0365 < p < 0.05$) The equation of “maximum 2” is accepted. In other words; It is decided that there are 2 cointegrated equations. In other words, as a result of the Johansen Cointegration Test, it was determined that there were 2 long-term vector relationships between the variables.

3.4.3. Granger Causality Test

Granger causality test is the most preferred method due to its ease of applicability. Granger causality test is used to find out whether there is a relationship between the series and if there is a relationship, it is used to find the direction of the relationship. (Küçüksille ve Karaoğlu 2016, 56)

Table 10*Granger Causality Test Results*

	CARGO / CARGO AMOUNT (DEPENDENT VARIABLE)	Prob. (P Value)
1. MODEL	GDP / Gross Domestic Product (Independent Variable)	0.0005
	OIL / Oil Price (Independent Variable)	0.0000
	PAX / Number of Passengers Carried (Independent Variable)	0.0028
	GDP / GROSS DOMESTIC PRODUCT (DEPENDENT VARIABLE)	Prob. (P Value)
2. MODEL	CARGO / Cargo Amount (Dependent Variable)	0.0630
	OIL / Oil Price (Independent Variable)	0.1002
	PAX / Number of Passengers Carried (Independent Variable)	0.0230
	OIL / OIL PRICE (DEPENDENT VARIABLE)	Prob. (P Value)
3. MODEL	CARGO / Cargo Amount (Dependent Variable)	0.0001
	GDP / Gross Domestic Product (Dependent Variable)	0.0003
	PAX / Number of Passengers Carried (Independent Variable)	0.0028
	PAX / NUMBER OF PASSENGERS CARRIED (DEPENDENT VARIABLE)	Prob. (P Value)
4. MODEL	CARGO / Cargo Amount (Dependent Variable)	0.0000
	GDP / Gross Domestic Product (Dependent Variable)	0.0053
	OIL / Oil Price (Independent Variable)	0.0077

When the causality test results are examined; It is seen that four models have been put forward in which cargo amount (CARGO), Gross Domestic Product (GDP), oil price (OIL) and total number of passengers (PAX) are dependent variables, respectively.

According to model 1; cargo quantity (CARGO) is the dependent variable, including Gross Domestic Product (GDP, $p=0.0005$), oil price (OIL, $p=0.0000$) and total number of passengers (PAX, $p=0.0028$). p -values calculated for its independent variables; It was determined that it was lower than the critical value ($0.0000 < 0.0005 < 0.0028 < p < 0.05$). In this case, it is possible to say that there is a causal relationship between gross domestic product, oil price, and the total number of passengers and the amount of cargo. In other words, gross domestic product, oil price, and total number of passengers; affects the amount of cargo transported. Judge et al. (2017), in their study, the factors determining air transport in South Asian Countries were examined with the help of panel data analysis using the data of the 1973-2015

period. In the study, the total number of passengers, air cargo volume, GDP per capita, fuel prices were used as variables. Contrary to the findings of this study; In the analysis in which the number of air passengers and air cargo volume were chosen as dependent variables, it was seen that GDP, foreign direct investment, industry, flight frequency and population variables had a positive effect on airline demand and air cargo, while jet fuel prices had a negative effect (Hakim and Merkert, 2019: 120).

According to model 2; Gross Domestic Product (GDP) is the dependent variable, and the p values calculated for the independent variables of the number of passengers carried (PAX, $p=0.0230<0.05$); found to be lower than the critical value. However, the p values for the independent variable oil price (OIL, $p=0.1002>0.05$) and the independent variable cargo quantity (CARGO, $p=0.0630>0.05$) were found to be larger than the critical value. In this case, there isn't any causal relationship between the amount of cargo carried and the gross domestic product. However, there is no causal relationship between the oil price and cargo and the gross domestic product. In other words, the total number of passengers carried; positive effect on the gross domestic product. Beyzatlar, et al., (2014: 44) investigated whether there is a relationship between transport and GDP. One-way Granger causality relationship was determined using panel data analysis. An endogenous structure has been found between income and transportation. Also Valdes, (2015: 75), using the 2002-2008 period, the determinants of airline demand for 32 middle-income countries were examined by static and dynamic panel data analysis method. In the analysis using GDP, total number of passengers and fuel prices variables, it is seen that the increase in GDP has a positive effect on airline demand. But contrary to the findings of this research, the existence of a negative relationship exposed between CPI and fuel prices and airline demand.

In their study, Kiracı and Bakır (2019: 197) examined the relationship between air transport and GDP, using the Panel Causality Analysis technique with the 1990-2016 period data for 70 countries grouped by income level. As a result of the analyzes made in the study, in which GDP per capita and airway variables were used, a causal relationship was obtained between GDP and airway. In addition, the direction of the causality relationship from GDP to air transport or from air transport to GDP is among the empirical findings that vary according to the income level of the countries.

According to third model, oil price (OIL) is the dependent variable, cargo amount (CARGO, $p=0.0001$), Gross Domestic Product (GDP, $p=0.0003$) and total number of passengers (PAX, $p=0.0028$) of the calculated p-values for its arguments; It was determined that it was lower than the critical value ($0.0001 < 0.0003 < 0.0028 < p < 0.05$). In this case, it is possible to say that there is a causal relationship between gross domestic product, oil price and the total number of passengers and the amount of cargo. In other words, the amount of cargo carried, the gross domestic product and the total number of passengers carried; positive effect on oil prices. Baikgaki and Daw (2013: 389) examined the factors that determine domestic air demand in South Africa with the help of multiple regression model using 1971-2012 period data. It has been found that the increase in oil prices has a positive effect on the airline demand, while the increase in ticket prices has a negative effect on the airline demand.

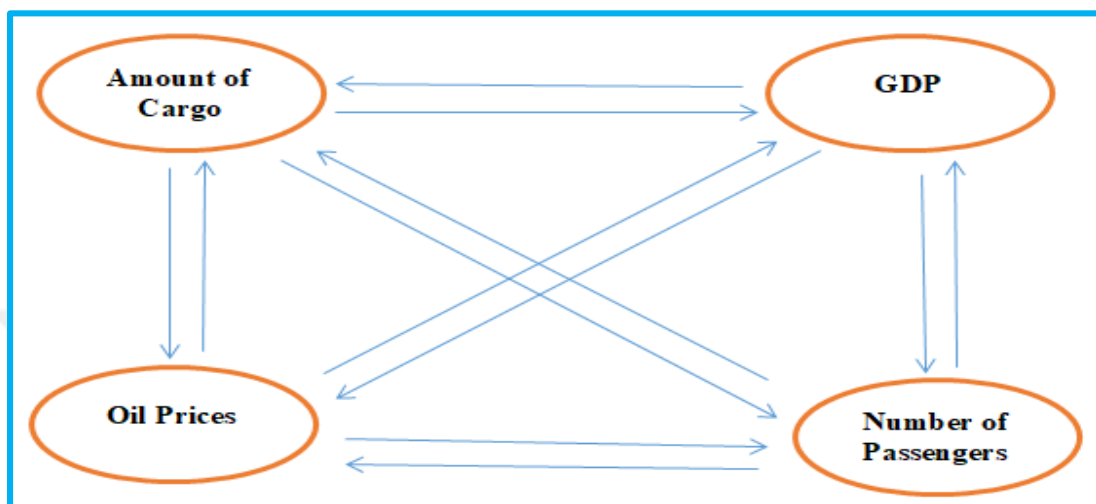
According to model 4; total number of passengers (PAX) is the dependent variable, Cargo Quantity (CARGO, $p=0.0000$), Gross Domestic Product (GDP, $p=0.0053$) and Oil Price (OIL $p=0.0077$).) of the calculated p-values for the independent variables; It was determined that it was lower than the critical value ($0.0000 < 0.0053 < 0.0077 < p < 0.05$). In this case, it is possible to say that there is a causal

relationship between the amount of cargo, gross domestic product and oil price and the total number of passengers. In other words, the amount of cargo carried, gross domestic product and oil price; positive effect on the total number of passengers. All analyzes using the three prediction techniques showed a positive correlation. In this context, improving airline services in international competition contributes to economic development, employment, growth and social welfare (Button and Taylor, 2000: 211).

When the causality test results are examined, it is seen that four models are put forward in which cargo quantity (CARGO), gross domestic product (GDPCUR), oil price (OIL) and total number of passengers (PAX) are dependent variables, respectively.

Figure 6

Bidirectional Casualty Relationships Between Oil Prices, GDP, Cargo Quantity and Number of Passengers



In general, it is seen that there is a two-way causality between oil prices and the amount of cargo and the number of passengers. In addition to the situation, it can be said that GDP is the cause of oil prices. There is a two-way causal relationship between the number of passengers and the amount of cargo, oil prices and GDP. It is possible to say that there is a two-way causality relationship between the amount of cargo and the number of passengers and oil prices. It can also be said that changes in GDP are affected by the amount of cargo. It can be said that there is a two-way causality relationship between GDP and the number of passengers.

CHAPTER 4. CONCLUSION AND RECOMMENDATIONS

In this study; The causal relationship between GDP between 1960-2019 in Turkey, air transportation indicators, amount of cargo, number of passengers carried and oil prices was analyzed and the results and suggestions were listed as follows;

In this study, trace values calculated as a result of Johansen Co-Integration Test and test statistics of eigenvalue were calculated, the equations obtained were tested and as a result; The p value of the equation related to the “maximum of 2” option was less than the critical value ($0.0365 < p < 0.05$). In other words; It has been decided that there are 2 cointegrated equations and it has been determined that there are 2 long-term vector relationships between the variables. When the results of the Granger causality test are examined; When Gross Domestic Product (GDP) is accepted as the dependent variable; a causal relationship has been determined between number of passengers carried and the gross domestic product. However, it has been determined that there is no causal relationship between amount of cargo carried and the oil price and the gross domestic product. So; Correlation coefficients were found to be greater than 0 and close to 1. Therefore; It was concluded that the correlation is positive. Gross domestic product, oil price, and total number of passengers; affects the amount of cargo transported. The total number of passengers carried; positive effect on the gross domestic product.

In times of crisis, governments' lowering taxes on fuel prices, providing low-interest incentives and downsizing of airlines for savings can help to gain an advantageous position in global competition. Detailed reports to be prepared about the logistics, supply chain, service industries and activities in the field of airline

transportation in Turkey; increase in statistics, international promotions and fair-type activities; can positively affect the industry.

As the air transport sector is a sector that requires large amounts of investment and has high fixed investment costs, there are difficulties in responding to the demands. In the aviation sector, due to fluctuations in demand and high investment costs, profitability rates decrease, competition increases, which can lead to bankruptcies and job losses. On the other hand; it is considered that during the economic crisis periods that lead to recession, cost increases and demand decrease, until the normal situation is restored, providing low-interest credit support to the air transport sector by the government, tax reduction and social security premium postponement or restructuring practices will reduce the negative effects of possible crises.

Findings in this study suggest that; improving cargo transportation and passenger transportation in airway transportation in Turkey; it is necessary to make innovations that can provide superiority in service quality and price competition in the world. In addition, preventing price instability, minimizing costs with new measures to be taken, minimizing existing problems in cargo transportation and making improvements by constantly considering consumer demands; all activities in air travel can also cause productivity and profitability to drop.

Further studies should focus on taking into account factors such as inflation, growth, international competition, government incentives; it would be beneficial to keep the research data date range wider, to include the latest data in the studies, and to consider the new studies in the field in the comparisons to be made.

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ANNEXES

Annex A: EViews Test Results

UNIT ROOT TEST RESULTS TABLE (ADF)

Null Hypothesis: variable has unit root

Level		LOGGDPCUR	LOGACRAC	LOGCARGO	LOGOIL	LOGPAX
		R	FT			
With fixed	t-Statistics	-6.6398	-3.8240	-1.1967	-6.8754	-1.1186
	Prob.	0.0000	0.0129	0.6681	0.0000	0.7023
		***	**	n0	***	n0
Constant & Trend ile	t-Statistics	-6.6997	-3.6375	-1.7942	-6.8081	-5.7233
	Prob.	0.0000	0.0610	0.6914	0.0000	0.0001
		***	*	n0	***	***
Steady and Without Trend	t-Statistics	-6.2555	-0.5751	-0.6549	-6.8915	-0.4798
	Prob.	0.0000	0.4499	0.4280	0.0000	0.5034
		***	n0	n0	***	n0
At First Difference		d(LOGGDPCUR)	d(LOGACRAC)	d(LOGCARGO)	d (LOGOIL)	d(LOGPAX)
With fixed	t-Statistics	-10.3541	-5.7465	-8.0479	-8.0345	-8.0392
	Prob.	0.0000	0.0005	0.0000	0.0000	0.0000
		***	***	***	***	***
Constant & Trend ile	t-Statistics	-10.3291	-5.9318	-7.9327	-8.1282	-6.9628
	Prob.	0.0000	0.0018	0.0000	0.0000	0.0000
		***	***	***	***	***
Steady and Without Trend	t-Statistics	-10.4435	-6.0114	-3.4353	-8.0860	-8.0492
	Prob.	0.0000	0.0000	0.0010	0.0000	0.0000
		***	***	***	***	***

Notes:

a: (*) significant at 10%; (**) 5% significant; (***) Significant at 1% and (no) Unimportant

b: Delay Length as per SIC

c: Probability is based on one-sided p-values by MacKinnon (1996).

This Result is Enhanced by the Program's Exit:

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VAR Delay Order Selection Criteria

Endogenous variables: LOGGDPCUR LOGCARGO LOGACRACFT
LOGOIL LOGPAX

External variables: C

History: 01/10/21 Saat: 14:12

Sample: 1960 2019

Included observations: 15

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1089.681	NA*	1.68e+57	145.9575	146.1935*	145.9550
1	-1058.492	37.42635	9.34e+56*	145.1323*	146.5484	145.1172*

* shows the delay sequence selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Johansen Cointegration Test

History: 01/10/21 Saat: 14:41

Example (set): 1964 2018

Included observations: After 55 adjustments

Trend assumption: No decisive trend

Sequence: LOGGDPCUR LOGOIL LOGPAX LOGCARGO

Lag range (at first differences): 1 to 1

Unlimited Cointegration Ranking Test (Monitoring)

Default CE number	Eigenvalue	Tracing Statistics	0.05 Critical value	Probe. **
None *	0.807615	131.7097	40.17493	0.0000
Up to 1 *	0.400454	41.05548	24.27596	0.0002
Up to 2 *	0.195968	12.91845	12.32090	0.0397
Up to 3	0.016624	0.922026	4.129906	0.3901

Trace test shows 3 equations cointegrating at 0.05 level

* Indicates that the 0.05 level hypothesis is rejected

**MacKinnon-Haug-Michelis (1999) p-values

Unlimited Cointegration Rank Test (Maximum Eigenvalue)

Default CE number	Eigenvalue	Max-Eigen Statistics	0.05 Critical value	Probe. **
None *	0.807615	90.65426	24.15921	0.0000
Up to 1 *	0.400454	28.13703	17.79730	0.0010
Up to 2 *	0.195968	11.99642	11.22480	0.0365
Up to 3	0.016624	0.922026	4.129906	0.3901

Maximum eigenvalue test shows 3 cointegrating equations at 0.05 level

* Indicates that the 0.05 level hypothesis is rejected

**MacKinnon-Haug-Michelis (1999) p-values

Unlimited Cointegration Coefficients (normalized by $b' S_{11} b = I$):

LOGGDPCUR	LOGOIL	LOGPAX	LOGCARGO
5.96E-12	0.011130	-3.72E-08	2.82E-05
-2.52E-11	0.189363	6.04E-08	-2.88E-06
-4.22E-11	0.054161	9.23E-08	4.12E-06
1.43E-11	-0.037675	-2.12E-07	1.20E-06

Unlimited Setting Coefficients (alpha):

D(LOGGDPCUR)				
R)	-4.93E+09	1.82E+09	1.61E+10	3.05E+09
D (LOGOIL)	-3.212620	-5.278561	1.981416	0.738539
D(LOGPAX)	-88157.67	537159.5	-682137.6	519473.1
D(LOGCARGO)				
)	-77906.44	12024.97	-15798.03	7497.242

1 Cointegration Equation (s): Daily probability -3201.805

Normalized cointegration coefficients (standard error in parentheses)

LOGGDPCUR	LOGOIL	LOGPAX	LOGCARGO
1.000000	1.87E+09	-6239.294	4735225.
	(1.6E+09)	(2004.54)	(331726.)

Setting coefficients (standard error in brackets)

D(LOGGDPCUR)	
R)	-0.029392
	(0.03672)
D (LOGOIL)	-1.92E-11
	(9.4E-12)
D(LOGPAX)	-5.26E-07
	(3.7E-06)
D(LOGCARGO)	
)	-4.65E-07
	(6.8E-08)

2 Cointegrating Equation (s): Daily probability -3187.736

Normalized cointegration coefficients (standard error in parentheses)

LOGGDPCUR	LOGOIL	LOGPAX	LOGCARGO
1.000000	0.000000	-5474.779	3815550.
		(1622.42)	(268275.)
0.000000	1.000000	-4.10E-07	0.000493
		(2.5E-07)	(4.1E-05)

Setting coefficients (standard error in brackets)

D(LOGGDPCUR)		
R)	-0.075269	2.90E+08
	(0.15938)	(1.2E+09)
D (LOGOIL)	1.14E-10	-1.035319
	(3.6E-11)	(0.26423)
D(LOGPAX)	-1.41E-05	100736.8
	(1.6E-05)	(117057.)
D(LOGCARGO)		
)	-7.68E-07	1409.984
	(2.9E-07)	(2132.12)

3 Cointegrating Equation (s): Daily probability -3181.738

Normalized cointegration coefficients (standard error in parentheses)

LOGGDPCUR	LOGOIL	LOGPAX	LOGCARGO
1.000000	0.000000	0.000000	-2692505. (426052.)
0.000000	1.000000	0.000000	5.82E-06 (4.2E-05)
0.000000	0.000000	1.000000	-1188.734 (107.580)

Setting coefficients (standard error in brackets)

D(LOGGDPCUR)			
R)	-0.754473 (0.28285)	1.16E+09 (1.1E+09)	1780.266 (665.533)
D (LOGOIL)	3.04E-11 (6.8E-11)	-0.928004 (0.26917)	-1.66E-08 (1.6E-07)
D(LOGPAX)	1.47E-05 (3.0E-05)	63791.66 (120239.)	-0.027213 (0.07096)
D(LOGCARGO)	-1.02E-07 (5.5E-07)	554.3497 (2173.09)	0.002167 (0.00128)

Granger Causality Test

VAR Granger Causality / Block Externality Wald Tests

History: 01/10/21 Saat: 16:56

Sample: 1960 2019

Included observations: 52

The dependent variable: LOGCARGO

Excluded	Chi-square	df	Prob.
LOGGDPCUR	22.31295	5	0.0005
LOGOIL	29.02119	5	0.0000
LOGPAX	18.12160	5	0.0028
Everything		10	---

The dependent variable: LOGGDPCUR

Excluded	Chi-square	df	Prob.
LOGCARGO	10.46826	5	0.0630
LOGOIL	9.232216	5	0.1002
LOGPAX	13.04596	5	0.0230
Everything	42.40536	15	0.0002

The dependent variable: LOGOIL

Excluded	Chi-square	df	Prob.
----------	------------	----	-------

LOGCARGO	25.98069	5	0.0001
LOGGDPCUR	23.67150	5	0.0003
LOGPAX	18.15944	5	0.0028
Everything	58.89044	15	0.0000

The dependent variable: LOGPAX

Excluded	Chi-square	df	Prob.
LOGCARGO	64.46309	5	0.0000
LOGGDPCUR	16.61200	5	0.0053
LOGOIL	15.70837	5	0.0077
Everything		10	---

Test statistics are not available for constrained delay coefficients

Vector Error Correction Model

Vector Error Correction Predictions

History: 11/17/20 Time: 12:43

Example (set): 1968 2018

Included observations: After 51 adjustments

Standard errors in () and [] t-statistics

Cointegration Equation:	CointEq1	CointEq2		
LNGDP(-1)	1.000000	0.000000		
LOGCARGO(-1)	0.000000	1.000000		
LOGOIL(-1)	0.029199 (0.05511) [0.52987]	313.5623 (427.604) [0.73330]		
LOGPAX(-1)	-1.73E-08 (4.6E-08) [-0.37487]	-0.000988 (0.00036) [-2.76582]		
Error correction:	D(LNGDP)	D(LOGCARGO)	D (LOGOIL)	D(LOGPAX)
CointEq1	-4.383992 (1.06089) [-4.13237]	-23510.39 (9505.78) [-2.47327]	-4.429195 (2.21181) [-2.00252]	-1873061. (684200.) [-2.73759]
CointEq2	0.000209 (0.00013) [1.55139]	-1.750895 (1.20469) [-1.45340]	0.000788 (0.00028) [2.81159]	128.7307 (86.7104) [1.48460]
D(LNGDP(-1))	2.504210 (0.94502) [2.64990]	17623.43 (8467.58) [2.08128]	3.528625 (1.97024) [1.79096]	1502724. (609473.) [2.46561]
D(LNGDP(-2))	1.856613	15880.98	3.027119	1357905.

	(0.77511) [2.39530]	(6945.10) [2.28664]	(1.61599) [1.87323]	(499889.) [2.71641]
D(LNGDP(-3))	1.215216 (0.60331) [2.01425]	12419.94 (5405.77) [2.29753]	1.980720 (1.25782) [1.57472]	1122730. (389093.) [2.88551]
D(LNGDP(-4))	0.483081 (0.40945) [1.17983]	6610.130 (3668.76) [1.80173]	1.329107 (0.85365) [1.55697]	580467.3 (264067.) [2.19818]
D(LNGDP(-5))	0.080927 (0.22294) [0.36300]	2076.918 (1997.59) [1.03971]	0.511811 (0.46480) [1.10114]	253755.9 (143781.) [1.76488]
D(LOGCARGO(-1))	-0.000172 (0.00013) [-1.35587]	0.495005 (1.13732) [0.43524]	-0.000689 (0.00026) [-2.60525]	-93.77360 (81.8613) [-1.14552]
D(LOGCARGO(-2))	-0.000142 (0.00011) [-1.32401]	-0.068181 (0.96396) [-0.07073]	-0.000660 (0.00022) [-2.94125]	-87.06128 (69.3832) [-1.25479]
D(LOGCARGO(-3))	-8.66E-05 (8.5E-05) [-1.02071]	-0.171483 (0.76053) [-0.22548]	-0.000484 (0.00018) [-2.73633]	-65.91891 (54.7409) [-1.20420]
D(LOGCARGO(-4))	-1.19E-05 (5.8E-05) [-0.20557]	0.719861 (0.51916) [1.38659]	-0.000294 (0.00012) [-2.42994]	14.69400 (37.3675) [0.39323]
D(LOGCARGO(-5))	2.10E-05 (2.4E-05) [0.87308]	0.750389 (0.21502) [3.48982]	-9.31E-05 (5.0E-05) [-1.86167]	21.32911 (15.4767) [1.37814]
D (LOGOIL (-1))	-0.072485 (0.08607) [-0.84214]	-1347.993 (771.227) [-1.74786]	-0.670525 (0.17945) [-3.73656]	-30975.69 (55510.7) [-0.55801]
D(LOGOIL(-2))	-0.043481 (0.08930) [-0.48690]	601.5736 (800.149) [0.75183]	-0.718596 (0.18618) [-3.85970]	80439.45 (57592.5) [1.39670]
D(LOGOIL(-3))	0.029091 (0.08578) [0.33914]	1726.940 (768.594) [2.24688]	-0.694527 (0.17884) [-3.88358]	37272.40 (55321.2) [0.67375]
D(LOGOIL(-4))	-0.067275 (0.09774) [-0.68828]	-2296.301 (875.803) [-2.62194]	-0.781565 (0.20378) [-3.83529]	-88553.35 (63037.8) [-1.40477]
D(LOGOIL(-5))	0.057566 (0.10579) [0.54418]	853.5008 (947.870) [0.90044]	0.024812 (0.22055) [0.11250]	103268.5 (68225.0) [1.51365]
D(LOGPAX(-1))	-2.75E-08 (3.2E-07) [-0.08642]	-0.002842 (0.00285) [-0.99786]	-3.51E-07 (6.6E-07) [-0.52960]	-0.614939 (0.20498) [-2.99995]
D(LOGPAX(-2))	4.71E-07	0.005915	2.95E-08	0.140491

	(3.7E-07) [1.27411]	(0.00332) [1.78396]	(7.7E-07) [0.03818]	(0.23864) [0.58872]
D(LOGPAX(-3))	1.51E-08 (4.1E-07) [0.03675]	-0.001346 (0.00369) [-0.36510]	-1.17E-06 (8.6E-07) [-1.35847]	-0.192071 (0.26536) [-0.72381]
D(LOGPAX(-4))	-6.08E-07 (4.1E-07) [-1.49411]	-0.011566 (0.00365) [-3.17110]	-8.35E-07 (8.5E-07) [-0.98364]	-0.543243 (0.26252) [-2.06935]
D(LOGPAX(-5))	-2.44E-07 (4.2E-07) [-0.58205]	0.001493 (0.00375) [0.39756]	-3.40E-06 (8.7E-07) [-3.89013]	0.283710 (0.27026) [1.04976]
R-square	0.886529	0.976661	0.808508	0.878286
Adj. R-square	0.804360	0.959761	0.669841	0.790148
Total square meter housing	539.5888	4.33E+10	2345.414	2.24E+14
SE equation	4.313526	38650.06	8.993127	2781923.
F statistics	10.78914	57.78951	5.830585	9.964886
Daily probability	-132.5199	-596.6478	-169.9898	-814.7417
Akaike AIC	6.059604	24.26070	7.529014	32.81340
Schwarz SC	6.892940	25.09404	8.362350	33.64674
Average dependent	0.036275	-633.8235	0.324314	337971.4
Depends on SD	9.752233	192675.8	15.65126	6072788.
Determinant residual covariance (dof adj.)	7.30E+24			
Determinative residual covariance	7.64E+23			
Daily probability	-1691.770			
Akaike information criterion	70.10861			
Schwarz kriteri	73.74499			
Number of coefficients	96			

Appendix B: Tables

Table 8: Turkish Airlines Total Turnover Comparison 2015 and 2018: (\$/dollar)

Moon	2018	2018 etc 2017	2017	2017 etc 2016	2016	2016 etc 2015	2015
Total	11.846.186.320	16%	10.235.647.120	13,2 %	9.039.187.042	-8,6%	9.893.079.272
01	960.735.578	59%	605.816.283	-15,5 %	716.635.068	-8,9%	786.673.001
02	927.504.913	33%	694.787.297	-7,1%	747.758.077	-2,5%	766.920.758
03	1.108.581.710	26%	881.819.963	7,3%	821.987.768	-9,0%	903.367.453
04	1.088.317.418	30%	838.467.303	7,4%	780.588.557	-8,8%	855.518.024
05	1.068.552.512	12%	954.937.922	7,1%	891.986.425	-2,6%	915.375.668
06	1.004.309.275	8%	929.026.422	7,1%	867.683.030	-5,1%	914.750.649
07	1.180.174.615	16%	1.017.884.548	61,6 %	629.983.391	-29,1 %	889.092.565
08	991.079.086	-8%	1.081.831.642	20,8 %	895.236.406	1,6%	881.099.287

09	955.304.800	6%	902.272.517	18,8 %	759.645.116	-9,7%	841.010.478
10	966.080.054	11%	872.936.150	25,2 %	697.174.616	- 12,1 %	792.910.831
11	840.165.990	2%	819.922.974	24,8 %	657.053.776	-5,9%	698.585.738
12	755.380.369	19%	635.944.100	10,9 %	573.454.811	- 11,5 %	647.774.820
Maximum / Month	1.180.174.615	9%	1.081.831.642	61,6 %	895.236.406	1,6%	915.375.668
Average / Month	987.182.193	16%	852.970.593	14,0 %	753.265.587	-7,8%	824.423.273
Minimum / Month	755.380.369	24,7 %	605.816.283	- 15,5 %	573.454.811	- 29,1 %	647.774.820

Source: (Turkish Airlines, 2020).

Table 10: Share of Low Cost Carrier seats from 2004 to 2013 in Turkey (%)

Years	Seat share%	
	Domestic	International
2004	2	1,70
2005	16,7	2,20
2006	15,2	3,10
2007	11,1	6,90
2008	17,6	8,00
2009	23,6	7,80
2010	50,4	20,00
2011	52	19,70
2012	50,4	19,90
2013	53,8	20,00

Source: Centre for Aviation [CAPA], 2018)