COVID 19 AND THE AIRLINE TICKETS PRICING FOR THE MOST ATTRACTIVE DESTINATIONS FROM KYIV

by

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LIST OF ABBREVIATIONS

IEV Kyiv International Airport (Zhuliany)

KBP Kyiv Boryspil International Airport

MSQ Minsk

VIE Vienna

WMI Warsaw Modlin

WAW Warsaw

RIX Riga

TLV Tel-Aviv

ICAO International Civil Aviation Organization

ANSP Air Navigation Service Provider

OPEC Organization of Petroleum Exporting Countries

CR Concentration Ratio

HHI Herfindahl-Hirschman Index

LCC Low Cost Company

FSC Full Services Company

UIA Ukrainian International Airlines

CHAPTER 1. INTRODUCTION

The airline industry has significantly changed over the last 10 years. The main difference is the behavior of purchasing airline tickets. We used to have the number of travel agencies which played the role of mediator between customers and producers in the past. It created the additional fee, as a consumer could only use the information provided by the mediator. Nowadays, with the development of internet connection and technologies, travelers have fast and easy access to all kinds of information about airline fares from different companies. There is complete transparency, as everyone can find information about available seats, services which are offered, flights timetable, and so on. Every person, who wants to buy a ticket, can make his/her choice by clicking on a webpage and have free access to a huge number of airline companies. The price is the main determinant of consumers' behavior. One of the reasons for that is the distance between destinations. Most flights are short-haul (from 30 minutes to 3 hours) and medium-haul (from 3 hours to 6) in Europe. Therefore, services don't play a huge role and the product is not differentiated – become similar. Business trip has been influenced by the quarantine mode significantly. Online meetings have become common thing for solving the business tasks. As a result, number of customers with inelastic demand decline.

The market pricing principle or demand principle is the way of how airline tickets are valued. The key to this principle is that price is not similar for groups with different price elasticity. It means that an airline company charges high prices for a segment with inelastic demand of consumers (business trips) and lower prices for those who have elastic demand. In such a way of pricing, the company can cover the costs of flights and reduce the risks of having losses due to the tickets that had not been sold. The company will raise the price if the demand is significantly rocked for a certain period of time, which creates an opportunity to sell tickets at a lower price when the willingness to pay is really low. Business people always have higher purchasing power, as companies pay for their tickets and

services. The time of buying the ticket is usually close to the flight. As a result, the price of tickets will be higher for purchasing the closer it gets to the flight. Travelers try to minimize their expenses on buying the airline ticket, they are more flexible in choosing the date and the time for arriving and also make their decision in advance. Therefore, to cover this segment of clients, tickets price will be lowest for the first people for early buyers.

This strategy of pricing had to change fundamentally due to the COVID-19. In current situation, demand for the airline services declined sharply. According to the International Air Transport Association (IATA)[1], it will take 4 years to reach the same level of the traffic as it was in 2019. Moreover, customer's behavior has been changed dramatically. Videoconference become common thing for all kind of business. It has negative effect on all airline industry, as it was the cluster of customers with the highest willingness to pay for a ticket. As for travelers, number of customers significantly declined due to the following reasons. First of all, they take additional risk, as there is no vaccine. Second reason is that some country closed their borders or created a quarantine mode for travelers, which significantly decreased the demand for travelling. As a result, airline companies have to change the model of pricing strategy to attract more customers and decrease the probability of going bankrupt.

The main goal of this study is to estimate how the factors which influence the airline ticket price from Kyiv to the five most attractive destinations has been changed due to the COVID-19. For analysis, five the most attractive destinations from Kyiv were chosen. According to the avianews.com[2], routes from Kyiv to Warsaw, Minsk, Tel-Aviv, Vienna and Riga are of the highest demand in Ukraine based on number of flights per week. Also, avianews.com[3] described the various reasons why these cities have the biggest amount of Ukrainian tourists:

[1]https://www.flightglobal.com/airlines/iata-passenger-demand-may-not-recover-until-2024/138357.article

[2]https://www.avianews.com/ukraine/2019/08/29/top_airroutes_from_Kyiv/

[3]https://www.avianews.com/ukraine/2019/08/29/top_airroutes_from_Kyiv/

- Warsaw has a huge demand for Ukrainian workers and students every year.
- Minsk has had a unique position since the 2015 year. Belavia can offer opportunities to provide the fastest connection from Kyiv to the biggest cities in the Russian Federation. Despite the fact that Ukraine and the Russian Federation are in the military conflict, this flight destination is still of huge demand for both countries.
- Tickets from Kyiv to Vienna one way were more than 100 dollars in the past. Nowadays, the price can fall to the mark of 10 dollars per flight. It increases the demand not only for Ukrainian travelers but for foreign customers too.

Based on this information, these destinations will be analyzed to prepare a clear understanding of changes in price strategy due to the COVID-19 for Ukrainian market. The questions that are asked in this proposal are as follows:

1. What factors influence the price and how?
2. What is the influence of COVID-19 on the price for airline tickets?

The data was web scraped from kayak.com in the beginning of May 2020 for the first time and in the end of August for the second time. Pooled ordinary least square analysis and robust regression were used to estimate the influence of different factors.

CHAPTER 2. INDUSTRY OVERVIEW AND RELATED STUDIES

2.1. Industry overview

According to Rigas Doganis, former a non-executive director of both EasyJet and South African Airways, "The airline industry is dynamic, fast-changing and subject to sudden and unexpected variations in the cost of many of its inputs. This is why a clear understanding of the costs of supplying airline services is essential to many decisions taken by airline managers"[4]. Therefore, direct costs become one of the main issues in industry overview as it has specific structure. Structural analysis of operating expenses is provided for clear understanding of the methodology of this study.

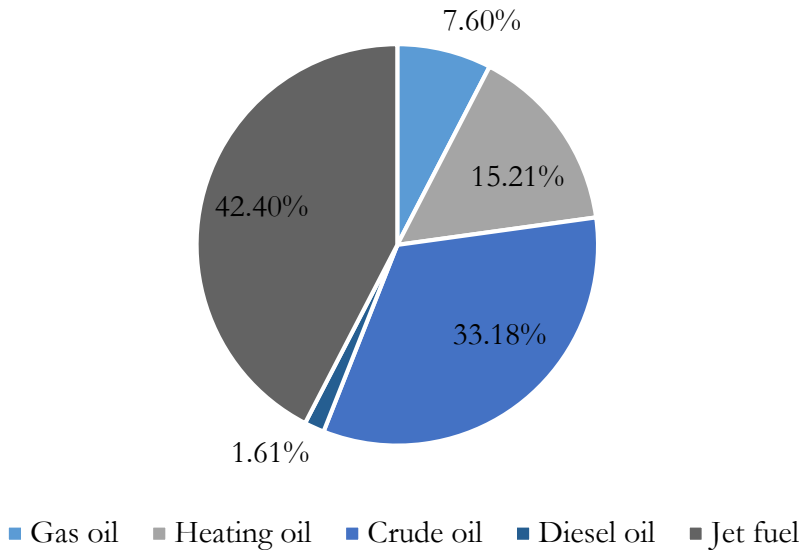
Operating expenses. Rewards for the flight crew is the expenses which include not only salaries of the workers or stopover expenses (expenses which company bears if the airplane cannot return immediately with the same crew), but also all social payments such as social security payments or insurances. Moreover, the pilot must have a special license. The requirements for being a pilot is different for each type of airplane. The longer destination is and the larger the airplane is the bigger salary is expected to be paid. Also, there are some regulations to be respected, whereby, for example, pilot and co-pilot can make only one flight for a certain period of time. This contributes to the safety of the passengers. The second part of operating expenses is fuel consumption. It takes around 30% of all costs.

Fuel is the next unique feature of this industry. The determinants of the amount of fuel consumed by the single flight are climate conditions (the weather condition, speed of the wind, changes in the atmosphere, and so on), size of the airplane, and age of the engine. All these factors make the costs of one trip be significantly non-identical. Also,

[4] https://books.google.com.ua/books?id=PTSMAgAAQBAJ&pg=PA64&source=gbs_toc_r&cad=2#v=onepage&q&f=false

price of aircraft fuel is positively correlated with a price for oil, as it is a major raw material for the aircraft fuel. Oil is priced by external factors that cannot be controlled by the airline country.

Figure 1
Underling commodity in financial hedging contracts



Source: "Fuel Hedging, Operational Hedging and Risk Exposure– Evidence from the Global Airline Industry", 2013

In this case, the financial instruments are used for hedging. It reduces future expenses due to the fluctuation in the market. The most frequently used instruments are swaps, call options, future, and forwards contracts. The collar (option financial strategy) is a combination of put and call options and was used in most of the cases of creating a portfolio. Britta Berghöfer and Brian Lucey(2013) provide the descriptive statistic of 586 financial reports which was collected from airline industry. Collar was used as an instrument for hedging in 97% of total number of firms. Call options were used in 57%. The author provided the underline commodities which were hedged (Figure 1). Jet fuel and heating oil creates number of commodity that where hedged in 75% number of companies. Maturities

for contracts had high volatility with average maturity at 18.68 months and median of 12 months.

Insurance of flight equipment and the fee which is charged by the airport are the next two costs of the flight. It usually takes less than 14% of total expenses, according to the data provided by ICAO[5]. Insurance of a flight is based on a few things: the purchase price of the ticket and the destination of the plane. If the destination is risky, for example, arrival airport is located in a country in a state of war, the insurance company will have charged an additional fee. En route (one destination) charge is based on national Unit rate (amount of money which is charged by the country from each flight) which is fixed for each country by the ANSP[6] on annual basis. Flights can hedge the expenses of this type of charges by avoiding the countries with high Unit rates, as a station for stop during the long route.

Depreciation is the part of indirect costs. It is generally calculated using the linear method with residual value in the range of 10-15% of purchasing price. Longer depreciation period is reducing the direct expenses, but some companies decide to make it shorter. The reason is that after a certain period, a company has the opportunity to sell the asset (aircraft) at a high price than book value. As a market value is determined by a more widely-used depreciation policy, it will be higher for the aircraft on the secondary market than book-value and it creates a non-operating profit. In the period of quarantine, it has changed, as demand for aircraft has declined.

[5]International Civil Aviation Organization

[6]Air navigation service provider

2.2. Porter's Five Forces analysis

To overview the whole industry and environment in which companies are developing, Porter's Five Forces analysis is used. According to the methodology, the attractiveness and profitability of the industry is defined through five main forces.

Threat of new entrants. Huge investments are required for the start business in airline industry. As for a new entrant, purchasing or lease the aircraft is the first thing to do. Airbus and Boeing are two companies that produced the aircraft for the aviation industry and have 91% market share globally[7]. The average price list is shown in Table 9 "Airbus aircraft 2018 average list prices (USD millions)". The cheapest model A220-100 has carrying capacity for 125 passengers and costs 81 million dollars. Moreover, purchasing aircraft is not a final stage. It is necessary to design a new channel for tickets distribution, have number of license which according to the law to provide the air transport services and many others. Experience plays also a big role in this industry. As your competitor has been providing their services during long period of time, you will probably have lower service level. Differentiate the product has become quite hard. Also, brand loyalty has changed dramatically in this industry. Customers usually used the same airline provider per trip in the past. Nowadays, they are willing to switch the company as the price for tickets will be lower. All this together made barriers to entry low and high attractiveness for the new entrant in the past. Nowadays, the threat of new entrances has significantly changed. Huge drop in the demand for leisure and business traveling create a surplus on the market. It shifts the demand curve left, and, as a result, decrease the price for airline tickets. Therefore, the level of competition increase. U.S. government subsidizes the biggest company in the industry and decrease the chances for new companies to be successful[8]. So, barriers to entry is high with low attractiveness for the new entrant.

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[7]https://www.forbes.com/sites/greatspeculations/2020/01/06/how-airbus-has-grown-over-the-years-to-dethrone-boeing-as-the-largest-commercial-aircraft-maker/#149024aa3a59

[8]https://www.nytimes.com/2020/04/14/business/coronavirus-airlines-bailout-treasury-department.html

Bargaining power of suppliers. We have defined that fuel and aircraft manufacture are the two major cost items for airline company. These make the power of suppliers very high, as both, fuel and manufacture are determined by external factors on which the company cannot have control. Airbus and Boeing have 91% share aircraft market, according to Forbes journal[9]. As a result, aircraft market creates conditions for lower bargaining power of airline companies. On the other hand, the price for leasing the aircraft significantly decreased due to the COVID-19. According to the CAPA[10], the number of aircraft leased decreased by more than 60%. As a result, the price for leasing the aircraft decreased. Also, the number of aircraft in service is twice lower than in January 2020[11]. All this factors create better opportunity for providing the services by new company. Aircraft fuel consists of thousands of different chemicals but the main component of producing the jet fuel is oil. Oil price is negatively correlated with net profit of the whole industry, as was mentioned by the AITA economics[12]. OPEC (Organization of Petroleum Exporting Countries) is a leading producer of oil commodities. By reducing the production level, OPEC can affect the price of oil to meet and satisfy the global needs. Hedging the oil price to reduce the expenses of future consumption as was mentioned before. However, this market is still very unpredictable. Due to all these factors, the bargaining power of suppliers is medium in the aviation industry.

Bargaining power of buyers. Evolution of the Internet technologies becomes one of the principal aspects which has changed the bargaining power of buyers dramatically in airline industry. Today, the process of purchasing the ticket can take a few seconds to see all the variety of flights, choose one of them and buy it by your smartphone. Global mobile

[9]https://www.forbes.com/sites/greatspeculations/2020/01/06/how-airbus-has-grown-over-the-years-to-dethrone-boeing-as-the-largest-commercial-aircraft-maker/#2bd8ba603a59

[10]https://centreforaviation.com/analysis/reports/aircraft-lessor-fleet-falls-disproportionately-lease-rates-plummet-530864

[11]https://centreforaviation.com/analysis/reports/aircraft-lessor-fleet-falls-disproportionately-lease-rates-plummet-530864

[12]https://www.tradefinanceglobal.com/posts/oil-prices-and-the-airline-industry/

data consumption has boosted tremandously. The quarterly internet consumption increased by more than 15 times in 2019 compared to 2014. The monthly consumed mobile data by one user has reached the highest level of 7.2 GB per month on average in 2019.[13]The same tendency we can see in the industry which provides services for travelers. The biggest one is Booking Holdings**,** which includes Booking.com, Priceline.com, Agoda.com, Kayak.com, Cheapflights, Rentalcars.com, Momondo, and OpenTable. Its revenue is significantly correlated with developing an internet connection. In Figure 6 "Revenue of Booking Holdings worldwide from 2007 to 2019 (in billion U.S. dollars)", we can see the sharp increasing in revenue with CAGR 24%. Changing the way of purchasing the commodity such as airline tickets, makes the bargaining power of buyers being very high in this industry. As time goes on, the term "brand loyalty" has become meaningless for customers. Lower prices for the tickets can easily switch customers' behavior. Moreover, customers take additional risk due to the COVID-19. As a result, customers will search for safer services, which increase the expenses of the company.

Threat of substitute products. For airline industry, the closest substitutes can be an opportunity to travel by car, train or sea/river. According to research of worldwide mobility services which was made by statista.com[14], train industry has the highest penetration rate with 11.7% of worldwide population. The Telegraph.co.uk[15] provide a list of reasons why customers prefer train to flight as a way of traveling. In case of airline industry, cut the price can change the customers' preferences as train cannot reach the same speed limit. It can also provide High Speed Rail road which is costly. As a result, the threat of substitute products is estimated to be on medium level as it can be probably influenced by the pricing strategy of the company. However, it is going to be changed in the future, as SpaceX present their new idea of Hyperloop[16]. Hyperloop Alpha will be the new type of

[13]GSMA intelligence data provided on https://datareportal.com/

[14]https://www.statista.com/outlook/263/100/mobility-services/worldwide

[15]https://www.telegraph.co.uk/

[16]https://www.spacex.com/sites/spacex/files/hyperloop_alpha.pdf

transportation, which will provide: speed over 1000 km per hour, lower costs, immunity to weather, safety and not damage the environment. All these features make it more attractive for customers. Until it is not available for customers, airline companies will hold their strong position on the market.

Rivalry among existing competitors. The airline industry is a highly competitive market. Many players have the same share of the market and customers have high bargaining power, as switching costs are low. Price became the main determinant of demand for each company's service. To show the empirical evidence, the concentration analysis is performed[17]. Table 7 "Analysis of CR8 Concentration Ratio Between 2006-2015" (full table is available in the appendix) shows the result of CR8 analysis. CR8 based on 8 largest firms and their share of the market of each region. The highest competition we can see on the North America and Australia region. European regions CR8 ratio is around 55%, which means the medium concentration. The lowest ratio is in Asia Pacific region, therefore there is a high competition level. Worldwide CR8 is quite low with positive CAGR 1.67% for the period of 10 years. The next indicator of competition is HHI (Herfindahl-Hirschman Index) and is presented on the Table 8 "Analysis of HHI Concentration Ratio Between 2006-2015" (full table is available in the appendix). It is measured in range from 0 to 10 000, where index lower than 2000 means low concentration rate, 2000-4000 means medium and higher than 4000 determines the low competition environment. The results are quite similar. North America and Australia have ratio of 1068,91 and 1613,1 respectively. However, these results estimate the competition on the North America and Australia market on the medium level. As CR8 is more based on the largest companies, it can be logical that the result is quite different. Also CR8 shows that North America and Australia regions have higher probability to become the oligopoly market. To summarize, in airline industry rivalry among existing competitors is high.

[17]https://www.researchgate.net/publication/317400734_Market_Share_the_Number_of_Competitors_and_Concentration_An_Empirical_Application_on_the_Airline_Industry

2.3. Related studies

Price discrimination is a strategy which allowed to sell the same goods or services to different categories of customers by non-identical price. Radka Vlčková (2017) provides analysis of changing the price for airline tickets from the date they are published to the departure date. Data were collected for 8 weeks. She determines that low-cost airline company is a significant dummy for the first month of estimation, which means that such a company is more willing to increase their prices. It is based on the fact that LCC is focused on more sensitive customers. Therefore, they use a more intensive peak load pricing strategy, which means that lower demand follows by the lower prices and vice versa. Also, she estimates the positive influence of GDP on prices, but the effect is slight and does not have any economic sense.

Zhang et al (2014) used one-way fare as a dependent variable for OLS model. It was measured as an equation of revenue from one route divided by the number of passengers on the same route. Nine factors were found to play a major role in regression analysis. The whole population has a negative affect while a number of passengers in the business category and kilometers per flight have a significantly positive effect on the dependent variable. One of the important things is the influence of having additional stops during the flight. As was mentioned before it is the part of direct costs. According to the results, having one-stop significantly increases the fare by 19.7% on average, although it might be due to the limitations of the research subject (the author investigated only European hub-to-hub markets)

Bilotkach et al (2012) provided the discussion paper, in which flight's occupancy rate was used as the dependent variable. Two basic indexes were calculated for estimation. The first one was the average price of all flights which were posted on the same date during the period before departure. The second one was created to identify the efficiency of the company's yield management. The volatility of the price, especially the number of the price drops, was included in this index. Generalized Least Squares and Two-Stage Least Squares

models were used. The result shows that both indexes have a significant effect. The average price index and occupancy rate are positively correlated. 1-dollar average price change influences the change of the dependent variable by 0.27%. Yield management has also a positive impact. One additional price drop (average price drop is equal to 18.41 dollars) increases the load factor by 2%.

Williams (2017) estimates the price change based on the time and, also, load factor, as a percentage of total seats sold. The author defined that leisure consumption is twice more elastic than consumption for business people. The second type of consumers sometimes pays 60% higher price.

CHAPTER 3. DATA

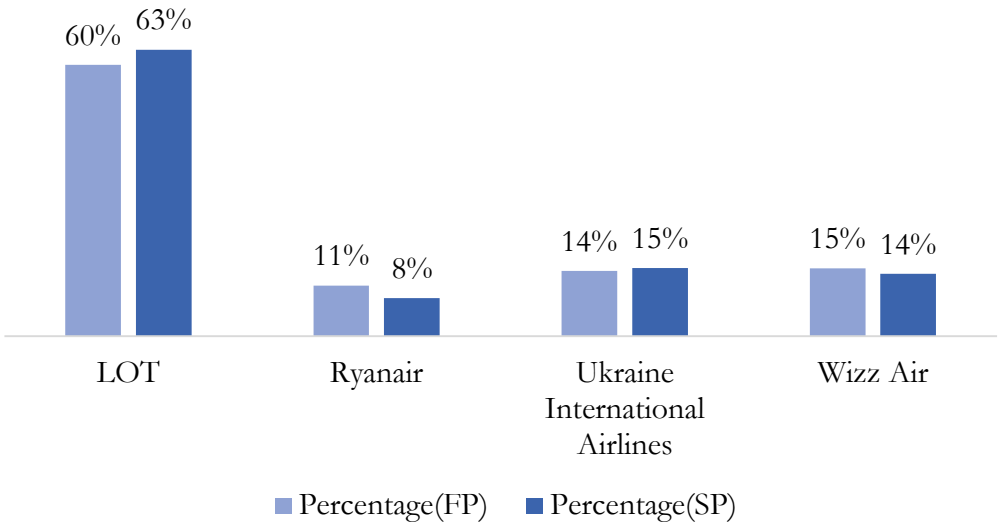
Data was web scraped from Kayak.com. It includes the 5 most attractive destinations for Ukrainians: Kyiv to Warsaw, Minsk, Tel-Aviv, Vienna and Riga and vice versa. All data has been scraped into to datasets: the first period (FP) contain information from 12 May 2020 till beginning of the March 2021 (it was scrapped in the beginning of May) and the second (SP) – from 1 September 2020 till the end of June 2021 as there was no more information, with including more than 40 000 observations. Data was scraped on weekly basis for better controlling the whole process of scraping. Also, data did not included round trips, so we exclude the opportunity of have discount on the tickets price. Than it was converted in yearly basis and include variables, as follows:

- Date. When is the departure date. Format: month/day.
- Out weekday. What is the day of the week when the flight is departure? Include weekdays from Monday to Friday.
- Out airline. Airline company which provide the services. For example: LOT, Airbaltic airline, Wizz Air etc.
- Out cities. The destination of the flight. For example: IEV-WAW mean flight from Kyiv (Boryspil airport) to Warsaw. KBP is used for Zhulyan airport.
- Out duration. Number of hours and minutes in the air. For example: the flights IEV-WAW takes 92 minutes.
- Out stops. Number of stop during the flight. Not direct flight. 0 – for the direct flights, 1 – for the flights with one additional stop (customer boarded another flight to the final destination) etc.
- Out stops cities. The city where the customer will boarder another flight.
- Price. Price of the tickets for 1 flight, measured in dollars.

The regression analysis is introduced for the whole data, while descriptive statistic is presented for each separate destination.

On Figure 2 "Share (number of flights), IEV-WAW", shown the market share for direct flight in two periods on the destination from Kyiv to Warsaw. LOT Polish Airlines is the major airline company in Poland. Its market share has been increased by 3% and takes 63% of market share for direct flights and 40.1% of total number of flights in the SP. Market share of LCC has declined by 3% for Ryanair and 1% for WizzAir company.

Figure 2
Share(number of flights), IEV-WAW

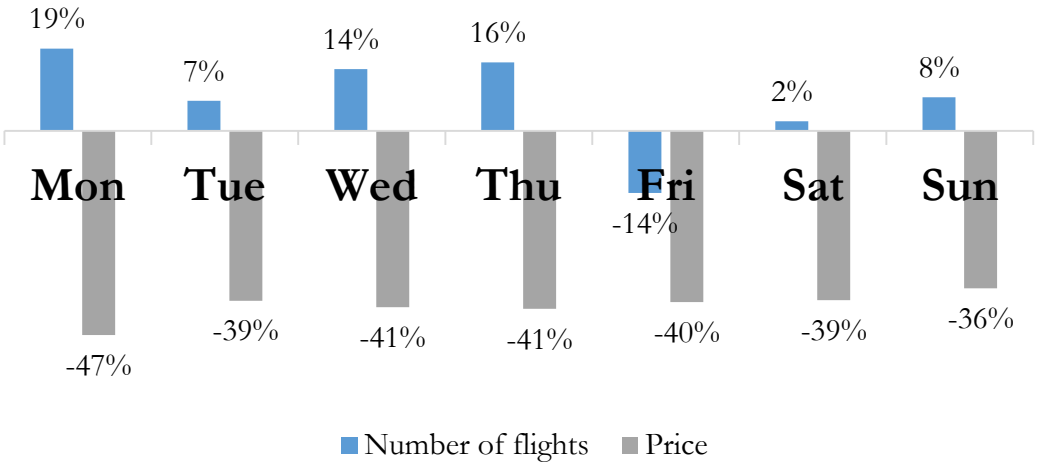


Direct flights represent more than 70% of whole sample in the FP, and represent 64% in the SP. Average out duration for 4 main companies (LOT, WizzAir, Ryanair, Ukrainian International Airlines) 92 minutes. Friday is the day with the highest decline of number of flights with comparing to the FP. Number of flights has declined by 14%. Also, night flights to Warsaw takes less than 2% of total departure time in SP. Number of flights with departure time from 4:30 am to 11:30 am has significantly increased and takes 56.5%.

The higher demand is followed by increasing in number of flights and decreasing the average ticket price, Figure 3 "Changes in Price and Number of Flights". Price for

the airline tickets significantly decreased due to the influence of COVID-19 on the demand for airline services. One of the reason can be the fact that passengers are more willing to buy tickets closer to the departure date. Therefore, the average price is significantly lower with comparing to the first period. Indirect flights mostly have stop in Vienna or Katowice (Poland). 75% of all indirect flights are provided by the same 4 companies: LOT, WizzAir, Ryanair, Ukrainian International Airlines. Number of flights WAW-IEV decrease by 8.6% percentage in the SP. The ratio for direct/indirect flights is the same. With decreasing the number of flights, share of Ukrainian International airlines decline by 4 percent, while Ryanair has increase its share of the market by 2%.

Figure 3
Changes in Price and Number of Flights



Number of flights is equally distributed with the sharp decline on Saturday by more than 100 on average in both periods. The biggest drop of number of flights is on Saturday and Thursday with 23% and 18% respectively. The price in the second period decreased by 41% on average with comparing to the first period. The cheapest day for flight is Saturday. The price for airline ticket with departure time on Saturday will be equal to 42$

on average in the second period, while customers were willing to pay 81$ in the first period.

The destination with highest demand is IEV-MSQ, as it creates one of the most important transport hub for Ukrainian travelers. Belavia is the Belarus airline company which provide the highest number of airline flights. It has the 65% share of the route flights, 1444 flights per 10 months in the FP and 67% of total flights in the SP. All flights that are provided by this company are direct. Out duration is equal to 60 minute on average and is the shortest time for the flights. Price per flight has small volatility from 86 (min price) to 98 (max price) in both periods. However, the ticket price for the flight can be higher than 200 dollars. The reason of this is quite hard to determine as there no holidays or festivals in Belarus at this time. Number of flights for both periods is similar for each day of the week. 441 flights have departure time from 4:30 am to 11:30 am, and classified to morning flights. The highest demand for this destination is defined to be in the evening as 40% of direct flights have departure time from 17:31 pm to 21:30 pm in both periods. Motor-Sich airline is the second company which provide direct flight from Zaporizhia to Minsk, but as we assumed to be located in Kyiv, this flight is determine to be indirect in our sample. Moreover, this airline company doesn't provide flight in the second period. Also, for the indirect flights in the FP, the most usual is flight with stop in Vienna which is provided by Austrian airlines. This technique is common for airline industry as providing indirect flight with stop in your country increase the total demand for services in airport and in the stop city also. Airbaltic airline also use this technique to attract more customers to Riga, and provide 106 flights from Kyiv to Minsk with stop in Riga. However, the number of flights, which is provided by Austrian airlines, has significantly decreased. Riga is the most attractive city for having additional stop in the SP. Destination MSQ-IEV has similar features. Belavia provide 69% of total flights number with the shortest duration of the flight. The tickets price cost 20% less which is equal to 70 dollars per one ticket in the FP and 75 dollars per ticket in the SP on average. Time from 11:31 am to 17:30 pm have twice bigger number of flights than another time

of the day. Airbaltic and LOT provide more than 50% of all indirect flights. The most unattractive type of flight is provided by Airbaltic. The price is very volatile, the lowest bound is 80 dollars and the highest is more than 500. Also, the flight will take more than 5 hours with one stop in Riga.

The third destination is IEV-RIX. More than 80% of total flights are indirect. The most common combination for the flight is shown in Table 10 "Share of the market on the destination IEV-RIX". In the FP, LOT has the biggest market share (22%). This airline company does not provide direct flight. All direct flights are provided by 3 companies: airBaltic, UIA and WizzAir. However, in the second period the company with the highest number of flights is airBaltic. It has increased the total number of flights by 5 times. Share of direct flights increased from 19% in the FP to more than 30% in the SP. Ukrainian International Airlines has canceled its direct flights. 59.8% of all flights have departure time in the morning in both periods. The average price drop by more than 20% on average, which is presented on the Figure 7. "Changes in average/number of the flights, IEV-RIX (all flights)". Friday is the weekday with the highest demand for having a flight in both periods. Therefore, Friday's ticket has the lowest drop in price. The minimum price is equal to 21 – 42 dollars and offered by Wizz Air. The shortest time of duration is 100 minutes, which is possible only for direct flights. The time to reach Riga is equal to 322 minutes on average. Warsaw, Minsk and Vilnius are three main stops city. For the destination RIX-IEV there are the same ratio of direct/indirect flights. Demand for flights is as high on Thursday, as on Friday in the FP, while the weekday with the highest demand is Monday in the SP. The most expensive day has shifted from Saturday to Monday in the second period, with price equal to 138. Time spent from Riga to Kyiv take 305 minute on average with 1 stop (69% of total flights have 1 stop). 63% of total flights have additional stop in Vienna, Vilnius, Warsaw, Minsk or Istanbul. Warsaw has the highest demand with 555 stops per 10 months in both periods.

The next hub with high level of demand is Vienna, IEV-VIE destination. 52% of total flights is direct and provided by the 4 companies: Austrian Airlines, Lauda, UIA and

Wizz Air. Also, Ryanair provide its services for the customers in the SP. The total number of flights has increased by 2%. Companies, which were presented in the FP, have lost 5% of market share on average. The reason is that Ryanair airline company provides 20% of total number of flights in the SP. Austrian Airlines has the biggest share of the market for direct flights and the highest average price while Wizz Air has the lowest price on average and provide more than twice less number of flights for the period from September to June 2021. The lowest price has decreased from 28 dollars per flight to 17 dollars. The flights with highest level of demand have departure time from 4:30am to 17:30 pm, which means that night flights have low demand among passengers. The direct flight from Kyiv to Vienna usually takes 115 minutes. For indirect flight the duration time is equal to 255 minutes on average. Total number of indirect flights is 1121 in the FP and 1224 in the SP with most of stops in Warsaw. Therefore, Warsaw is the main city for stop on this destination and, as a result, most of the flights are provided by Poland airline company – LOT. VIE-IEV destination has higher average price for direct flights, due to increasing the price for the ticket which are offered by Wizz Air company in the FP. The price rises by 66% on average in both periods. The price for Austrian Airlines services is significantly lower in the FP. It decreases by 13 dollars on average or by 13.5%, while, in the SP, the price has increased by 30 dollars per flight on average. Also, Austrian Airline has increased the market share for the destination VIE-IEV in both periods. In the SP, this company provides 47% of all direct flights to the Kyiv. The cheapest day for take a flight from Vienna to Kyiv is on Friday with the price 28 dollars. Moreover, on Friday there are significantly higher number of flights. However, number of flights are more normally distributed in the SP, with the cheapest price equal to 10-11 dollars per flight. The lowest demand for the night flights doesn't change. Flights equally distributed from 4:30 to 21:30. The minimum length of the flights is 115 minutes.

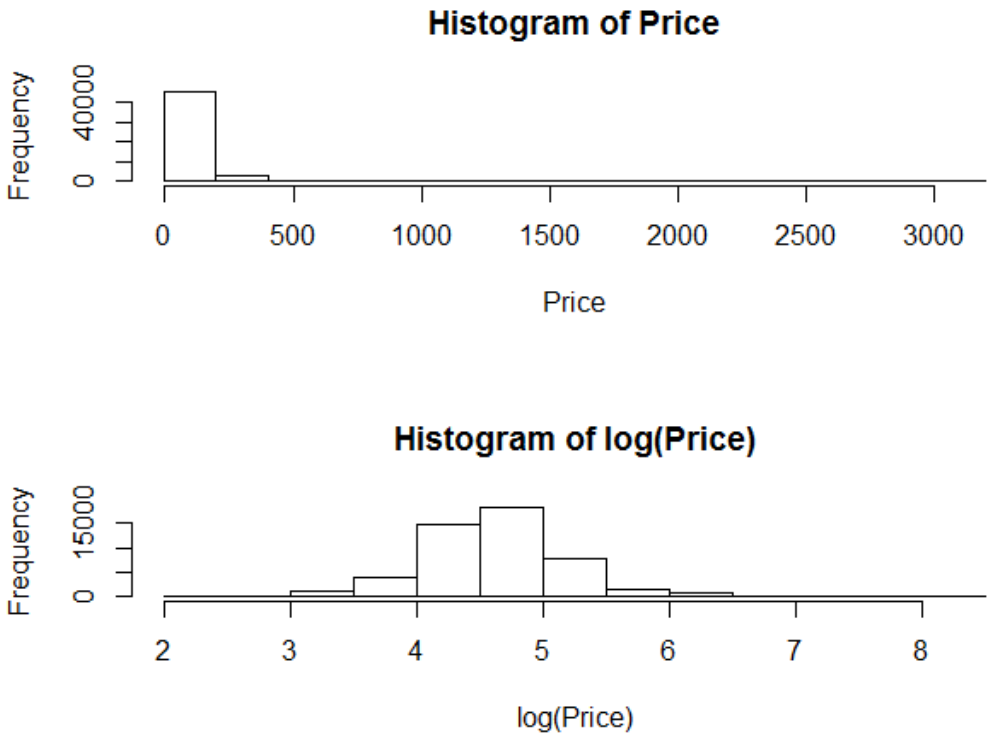
Ukraine International Airlines and EL AL are two companies offering the opportunity for direct flight IEV-TLV. 65% of flights is provided by UIA with the price 160 dollars per flight. EL Al company was twice cheaper in the FP, while in the SP it has

the same average price as UIA. Duration time for direct flight is 175 minutes. The departure time were normally distributed between morning and evening period of time with 95% confidence interval for the direct flights. However, 46% of the flights have departure time in the morning in the SP. There are two peaks with the highest demand for flights. These days are Thursday and Sunday. The minimum price for the ticket are provided by the EL AL airline company and equal to 119 dollars in the FP and 110 in the SP. The stop city with the highest number of flights has changed. Warsaw was the city with 32% of all indirect flights, while in the SP it takes only 5%. Istanbul has become the city with the highest number of stops – 34% of all indirect flights have additional stop in this city. For the destination TLV-IEV, number of indirect flights are significantly higher than direct flights and equal to around 70% of total flights. Istanbul was a central hub for stop and lands more than 35% of all flights from Tel-Aviv in the FP, while Budapest has the bigger number of indirect flights in the SP (172 flights with comparing to 164 flights, which have stop in Istanbul). Also, Turkish airlines lost their position of being the main airline, which performing the highest number of flights. The minimum price is increased from 53 dollars to 115.

CHAPTER 4. METHODOLOGY

Direct cost is one of the key determinants of price for airline tickets, as total sales have to cover the expenses to make the business profitable. On the other side, the price strategy in the airline industry is focused on demand. The price starts from the lowest bound and grows up towards the departure date. A few days before the flight leave the airport, price reaches the top point. For this reason, price is dependent variable, as measured for demand. Price is transformed to logarithmic form to reduce heteroscedasticity. Also, log(price) distribution is quite close to normal distribution. The difference between variable price (per one ticket) and log(price) is shown by using function hist() in R. The result is on Figure 4.

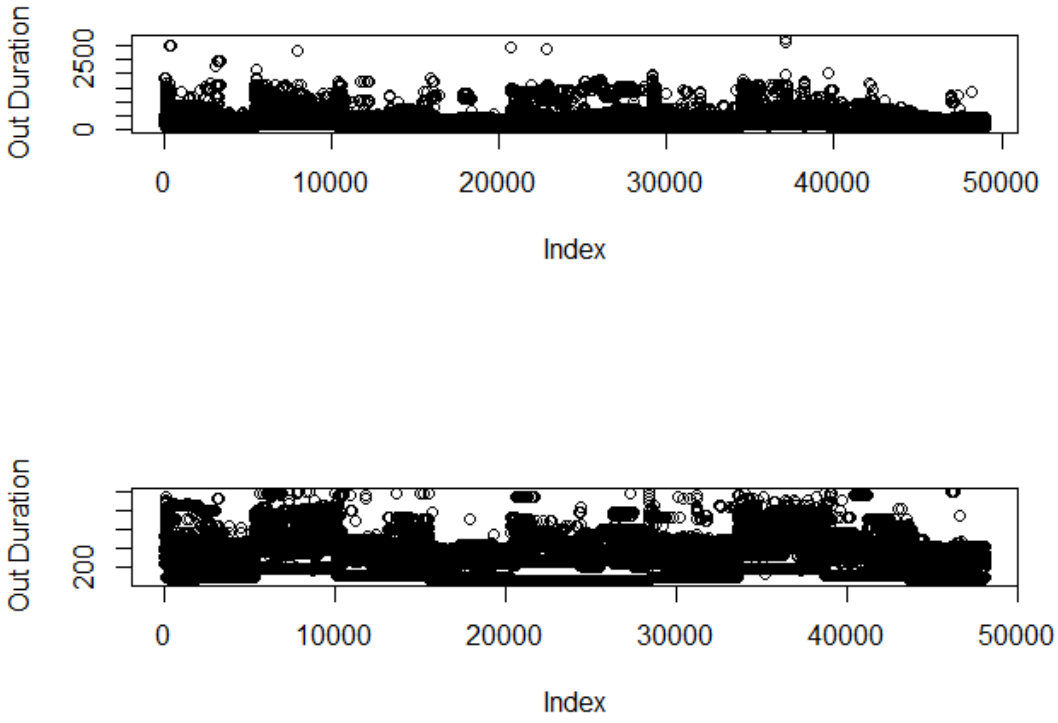
Figure 4
Comparing the variable price and log(price) per one ticket



As it was mentioned before, the fee which is charged by the airport is a part of direct cost. Airports have different charged prices. It basically depends on size of the airplane, number of arrivals and regions where airport is located. To reduce influence of endogenous factors on dependent variable, all destinations are grouped into different samples. Low cost company has airplanes with smaller number of seats and a result pays less fee. The fuel expenditure is minimized due to the size of airplane. Therefore, the difference between Low-cost company (LLC) and Full-services company (FSC) is significant. To determine the difference, binary variable is created for LCC. It reduces the exogenous influence of higher salaries, amortization expenses, and fuel consumption.

Fuel is the second largest part of direct costs and therefore, of the tickets price. Price of the fuel is based on the oil price. As was mentioned, to reduce the expenses, oil price is usually hedged by the airline companies. Each company has its unique portfolio of call/put options, swaps, and so on. The portfolio changed significantly often, has different maturities dates and as a result, is hard to be analyzed in a huge sample. There are cases where this information doesn't have public access. It is not significant to include the market oil price as a variable into regression, as it is not linear correlated. So, to indicate the fuel influence on the price, the time spend for the one flight is included. It is measured in minutes. After plotting the variable "Out Duration" (Figure 5), it is clearly seen that all flights that have duration over 1000 minutes are outliers. Moreover, there is a big difference between the lowest bound and the sample in range of 400-1000 minutes' duration. We don't exclude it from the sample as it shows two groups of the flights: direct (have the lowest duration) and indirect (have one additional stop). After these process, variable "Out duration" is used in regression for determining the influence of flights time on the price. Also, the assumption is that weather conditions will be the same for all flights as it is unpredictable.

Figure 5
Plot of the variable "Out Duration"



Time factor is divided into few variables, to determine all time basic influence on price:

- Month – include 11 months from May to March for the first period and for September to June 2021 for the second period. However, the fact that May was the last month of the spring and assumed to be the end of COVID-19, the impact of this month is expected to be insignificant. Also, the month add to the regression as an index. Therefore, the interpretation of the month influence on the dependent variable will exclude the fact of seasonality. The period of time from the fact of purchasing the ticket will be analyzed instead.

- Out weekday – characterized each day of the week. Used to determine the cheapest day for the flights, and marginal profit which is charged due to holidays and weekends.
- Dep_time – include 4 categorical variables: MRN –departure time from 4:30 am to 11:30 am, AFTR include departure time from 11:31 am to 17:30 pm, EVN – departure time from 17:31 pm to 21:30 pm, NGHT –departure time from 21:30 pm to 4:29 am. The day time is divided to the clusters as all of them have unique features. Night and evening time is the best time for go home from the holidays, while morning time will have a huge demand for the person, who has a business meeting.

The fact of additional stop is included as binary variable. Each additional airport creates their fee charged which influenced the price. Variable "Out stops" is included as a factor and show influence of having additional number of stops. The data presented in this study is panel. According to the "Introductory Econometrics: A Modern Approach, 5th edition" (2012) written by Jeffrey M. Wooldridge[18], the pooled OLS model was chosen. Therefore, the data has to be panel structured. Using p.dataframe() function in R, each flight in the first period will be comparing to the same flights in the second period. By doing so, only 11% of all data can be used for estimation. The reason is that 89% of flights has been changed (out weekday, departure time, and so on). It is statistically insignificant to make a conclusion on 11% of the whole data. As a result, the pooled OLS model with the binary variable has been chosen. Therefore, to estimate the changes in the price strategy of the airline companies from Kyiv to the 5 most attractive destination due to the COVID-19 period variable "COVID-19" is added. So, the final model for estimation is

[18]https://economics.ut.ac.ir/documents/3030266/14100645/Jeffrey_M._Wooldridge_Introductory_Econometrics_A_Modern_Approach__2012.pdf

$$\ln(Price)_t = \beta_0 + \beta_1 Out\ Stops_t + \beta_2 Month_t + \beta_3 LCC_t + \beta_4 Out\ Weekday_t + \beta_5 Out\ Duration_t + \beta_6 LOT_t + \beta_7 Dep\_time_t + \beta_8 COVID19_t + \beta_9 Out\ cities_t + \beta_{10} Direction_t + \varepsilon$$

, where: Out stops – categorical variable, 0 – direct flight, from 1 to 3- indirect flight; Month – categorical variable for each month; LCC – binary variable, 1 – low cost company, 0 – full service company; Out weekday – categorical variable for each day of the week from Monday to Sunday; Out duration – continuous variable measured in minutes for 1 flight; LOT – binary variable for the LOT airline company (it was decided to include the separate variable for this airline company, as it has the highest number of flights from Kyiv), 1 – the airline company is LOT, 0 – all others companies; Dep_time – categorical variable to determine the time of the day; COVID19 – the binary variable, 1 – for the period of COVID-10(second period), 0 for the first period; Out cities – the direction of the flight, from Kyiv or to Kyiv; Direction – binary variable, 1- for flights from Kyiv, 0 – for flights to Kyiv.

After the result is estimated, function vif() from package "caret" is used to find the correlation between variables. If the Value of GVIF is higher than 5, the independent variable is highly correlated with another one and have to be excluded. The vif()function shows that model has an aliased coefficient, which means that model has problem with perfect multicollinearity. The variable "Direction" was excluded and the problem was solved. The results of this test is shown on Table 1 "Correlation among independent variables". So, variable "Out Stops", "Out duration" and "Out cities" are highly correlated and create a problem of multicollinearity.

As variable "Out duration" and "Out cities" are quite important to define the influence of fuel consumption on the ticket's price and difference between price among 5 destinations, "Out Stops" is excluded from the regression. Table 2 "Correlation among

independent variables (without 'Out Stops')" shows that multicollinearity problem have been solved, as all GVIF < 5.

Table 1

Correlation among independent variables

Variable	GVIF	Df	GVIF^(1/(2*Df))
myData$`Out Stops`	4.37635	3	1.278946
myData$`Out Cities`	5.344	23	1.037106
myData$Period	1.03593	1	1.017808
myData$Month	1.08971	9	1.004784
myData$LCC	1.60355	1	1.266315
myData$Famous	1.44924	1	1.203843
myData$`Out Weekday`	1.05511	6	1.00448
myData$`Out Duration`	4.85079	1	2.202451
myData$Dep_time	1.57651	3	1.078821

Table 2

Correlation among independent variables (without 'Out Stops')

Variable	GVIF	Df	GVIF^(1/(2*Df))
myData$`Out Cities`	4.1005	23	1.031152
myData$Period	1.0348	1	1.017252
myData$Month	1.07956	9	1.004262
myData$LCC	1.51196	1	1.229619
myData$Famous	1.44694	1	1.202889
myData$`Out Weekday`	1.0502	6	1.00409
myData$`Out Duration`	1.52183	1	1.233626
myData$Dep_time	1.54326	3	1.074995

Therefore, the final model is:

$$\ln(Price)_t = \beta_0 + \beta_1 Month_t + \beta_2 LCC_t + \beta_3 Out\ Weekday_t + \beta_4 Out\ Duration_t + \beta_5 LOT_t + \beta_6 Dep\_time_t + \beta_7 COVID19_t + \beta_8 Out\ cities_t + \varepsilon$$

The pooled OLS model is going to be used for estimation. Also, to reduce the influence of potential outliers and decrease the standard error, robust regression is used too. Robust regression gives weights for each observation. It depends on the size of residual. If the residual is large, it has the lower weight. In this way, standard error will decline and estimated results are expected to be more precise. The big difference in results means that we are more likely to use robust regression, as the pooled OLS results are highly influenced by the outliers in the sample. Moreover, one of the assumptions in the pooled OLS model is homoscedasticity. Breusch-Pagan test is used with H0: homoscedasticity and H1: heteroscedasticity. P-value less than 0.05 or very close to 0 define that we reject the H0. That's means our model has random variance which may cause problems. In this case, the pooled OLS model will be rejected and interpretation of the variables will be based on weighted(robust) regression.

CHAPTER 5. RESULTS

5.1. Flights with departure date in future months

R2 is equal to 0.523, which means that 52.3% of the price changing are explained by our regression. Residual standard error is 0.302 in Robust regression estimation. The influence of having the flight in one of the month from May to beginning of March for the FP and from September to June is shown on Table 3 "Month of purchase". The first month of purchase (May for the FP and September for the SP) has the highest price of purchasing the ticket and has been chosen as a benchmark. Influence on the dependent variable is significant for all months at 99% confidence interval. As we have log-linear model, the interpretation of the estimated result is different than from linear model. For example, having a flight in the second month from purchasing change the price by $(e^{\beta} - 1) * 100$,

TABLE 3. Month of purchase

Month	Estimate (Robust Regression)	ΔPercentage (Robust Regression)	Estimate (Pooled OLS)	ΔPercentage (Pooled OLS)
2	-0.370***	-31%	-0.374***	-31%
3	-0.467***	-37%	-0.512***	-40%
4	-0.454***	-36%	-0.477***	-38%
5	-0.400***	-33%	-0.413***	-34%
6	-0.394***	-33%	-0.405***	-33%
7	-0.378***	-31%	-0.375***	-31%
8	-0.353***	-30%	-0.359***	-30%
9	-0.350***	-30%	-0.346***	-29%
10	-0.350***	-30%	-0.356***	-30%

Note: The first month is a benchmark

where β is equal to -0.370. Therefore, the cheapest month for having a flight is the third month from the date of purchasing. It decreases the price by 37% on average for all flights

with the first month as a benchmark. Also, the price starts to rise from the fifth month from the date of purchasing. The reason of that can be predicted recovery of the whole industry.

5.2. COVID-19, fuel consumption, LCC and LOT airlines

The influence of the binary variables is presented in Table 4 "Binary variables". The influence of COVID-19, which was estimated in the SP, is significant at 99% confidence

TABLE 4. Binary variables

Variable	Estimate (Robust Regression)	ΔPercentage (Robust Regression)	Estimate (Pooled OLS)	ΔPercentage (Pooled OLS)
COVID-19	-0.123***	-12%	-0.145***	-13%
LCC	-0.617***	-46%	-0.609***	-46%
LOT	0.111***	12%	0.100***	11%
Out Duration	0.001***	0.1%	0.001***	0.1%

interval. Having a flight in the COVID-19 period decrease the price by 12% on average for all 5 destinations. The sharp decline in the demand for the services of airline industry has not been supported with the same changes in the price of ticket. Services, which is provided by the low cost companies (Wizz Air, Ryan Air) with the highest number of flights, have 46% less price on average. LOT company has the biggest share in the market on average. Also, customer will pay 12% higher price for the services provided by LOT airlines company on average. In the COVID-19 period, customers have changed their behavioral, as a result, lower price level for the tickets will not guarantee the significantly higher number of customers on average. The out duration time is significantly positive correlated with the dependent variable. Additional 10 minutes of the duration increase the price by 1% on average. It is the excepted result, as duration time increase the fuel consumption, which is one of the main expenses of operational process.

5.3. Difference in prices for each destination and airport

The estimated influence of each destination on the price is presented for each airport on Table 5 "Destination".

TABLE 5. Destination

Destination	Estimate (Robust Regression)	ΔPercentage (Robust Regression)	Estimate (Pooled OLS)	ΔPercentage (Pooled OLS)
IEV-RIX	0.058***	6%	0.015	2%
IEV-TLV	0.008	1%	-0.063***	-6%
IEV-VIE	-0.055***	-5%	-0.095***	-9%
IEV-WAW	-0.354***	-30%	-0.332***	-28%
IEV-WMI	-0.654***	-48%	-0.655***	-48%
KBP-MSQ	0.207***	23%	0.377***	46%
KBP-RIX	0.140***	15%	0.193***	21%
KBP-TLV	0.217***	24%	0.192***	21%
KBP-VIE	-0.144***	-13%	-0.168***	-15%
KBP-WAW	-0.314***	-27%	-0.300***	-26%
KBP-WMI	-0.405***	-33%	-0.377***	-31%
MSQ-IEV	-0.147***	-14%	-0.146***	-14%
MSQ-KBP	0.024**	2%	0.210***	23%
RIX-IEV	0.111***	12%	0.095***	10%
RIX-KBP	0.118***	13%	0.157***	17%
TLV-IEV	0.054***	6%	0.014	1%
TLV-KBP	0.229***	26%	0.191***	21%
VIE-IEV	-0.005	0%	-0.026*	-3%
VIE-KBP	-0.021**	-2%	-0.009	-1%
WAW-IEV	-0.316***	-27%	-0.317***	-27%
WAW-KBP	-0.323***	-28%	-0.313***	-27%
WMI-IEV	-0.545***	-42%	-0.565***	-43%
WMI-KBP	-0.393***	-32%	-0.379***	-32%

Note: IEV-MSQ is a benchmark

As was mentioned before, each airport has their prices for all types of services. Therefore, the price is 23% higher for the flight from Kyiv Boryspil International Airport(KBP) to the Minsk National Airport(MSQ) with comparing to the price of ticket from Kyiv International Airport (Zhuliany) to MSQ. 72% of all flights on this destination is provided by the Belavia airline company, which has inelastic pricing strategy. The average duration time for the flight from Kyiv to Warsaw is significantly higher than for the flight to Minsk. The cheapest average price is from IEV to WMI. If customer will by the ticket from Kyiv to Warsaw Modlin airport, he/she will pay 48% less on average with IEV-MSQ as a benchmark. To conclude, the market with higher level of competition decrease the opportunity to charge more from the customer for the services in airline industry. Also, we can determine that customer will pay higher price for the flight from Kyiv Boryspil International Airport(KBP) than from Kyiv International Airport (Zhuliany) on the destinations from Kyiv to Tel-Aviv and Riga.

5.4. The influence of weekdays and the time of the day

The depended variable is significantly influenced by the time of the day (variable "Dep_time") at 99% confidence interval. Table 6 "The weekday and departure time" is presented the estimated result for each period of time. The depended variable is significantly influenced by the time of the day at 99% confidence interval. Departure time from 21:30 pm to 4:29 am (NGHT in the Table 6) is the cheapest time for having a flight. Tickets will have 8% less price on average with comparing to departure time from 11:31 am to 17:30 pm (afternoon) as a benchmark. Night time has the lowest demand and takes 11% of total number of flights. The unattractiveness of having a flight in the night can be the reason of the price declined. Monday, Tuesday, Thursday and Sunday are the weekdays with the highest price. Having a flight in on of this day significantly increase the by 3% on average with comparing to Friday as a benchmark at 99% confidence interval. The influence of Wednesday and Saturday on the depended variable is insignificant.

TABLE 6. The weekday and departure time

Variable	Estimate (Robust Regression)	ΔPercentage (Robust Regression)	Estimate (Pooled OLS)	ΔPercentage (Pooled OLS)
Mon	0.016***	2%	0.034***	3%
Tue	0.025***	3%	0.040***	4%
Wed	-0.010*	-1%	0.006	1%
Thu	0.028***	3%	0.040***	4%
Sat	0.003	0%	0.006	1%
Sun	0.032***	3%	0.033***	3%
MRN	-0.018***	-2%	-0.020***	-2%
EVN	-0.043***	-4%	-0.074***	-7%
NGHT	-0.079***	-8%	-0.103***	-10%

Note: Friday is a benchmark for the weekday

Afternoon is a benchmark for the time of the day

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

The main goal of this study was to estimate the influence of COVID-19, which has significantly impact on the airline industry. Routes from Kyiv to the five most attractive destination (the routes with the highest number of flights per week) was chosen. Each of them has it unique feature for the Ukrainian customers. Understanding of how the factors, which was analyzed, influenced the price create a clear understanding of customer behavioral during the COVID-19. The result of this study can also be interesting for the companies, which are going be successful on the Ukrainian market during the pandemic situation.

Pricing strategy in airline industry is quite difficult process. The price can be different due to a number of reasons: size of the airplane, fuel price, departure airport, salaries of workers, stopover expenses and so on. Moreover, all pricing strategy that have been using during the last decade are ineffective in the current year. Sharp drop in demand for traveling and, therefore, for airline services will change the industry dramatically. Online meeting become the usual thing for business sector. As a result, airline industry has lost a huge number of passenger who pay higher price for the services. The research questions of this study was to estimate:

1. What factors influenced the price?
2. What is the influence of COVID-19 on the price for airline tickets?

The data was scrapped from kayak.com for two periods: the first period contain information from 12 May 2020 till beginning of the March 2021 (it was scrapped in the beginning of May) and the second – from 1 September 2020 till the end of June 2021. The dataset includes more than 40 000 observations.

The pooled OLS model was chosen to estimate the influence of each variable on the price. The price was measured per one ticket for each flight. The price was transformed

to log(price), as the distribution of the log(price) is more similar to the normal distribution. The final model includes 8 variables and the R2 is equal to 52.3%. Robust regression was used to estimate more precise result.

The empirical result of the research questions shows that out duration is positively correlated with the price which is logical: companies charges higher price for tickets with higher level of fuel consumption. This can be a good example of pricing strategy in airline industry.

Low cost companies provide the cheapest service. The average price for the services, which is provided by LCC, is 46% lower. LCC have a higher chance for being successful during the crisis, with comparing to FCS, as the lower price will attract the significantly higher number of passengers. However, the quarantine mode has influenced on customer behavioral and preferences. Price is not a major factor for the customer during the COVID-19 period. Airline companies should provide the services with high level of customer safety. Therefore, the level of health safety is a new factor, which has influenced the demand for airline tickets.

LOT airlines are FSC and have significant the biggest share of total flights on the destination that was analyzed. This company provided a Miles&More program for people who are traveling. Using the benefits of this program, you can travel and collect the miles (like a bonus). All these bonuses can be used for purchasing tickets, pay for the hotel or rent a car. As a result, being a member of LOT company's club is one of the most attractive opportunities for Ukrainian's travelers.

Influenced of the departure time and month is the same for each model. The third and the fourth months are the cheapest for all destinations, while the first month has significantly the highest price. It can be explained by the fact that the flight can be canceled due to the changes in mode of the COVID-19. Countries are going to lock their borders for the countries, which have a high percent of patients. As the number of patients has

been increasing from the beginning of the quarantine till now, the probability of having a flight have been negative correlated with number of days before departure. Therefore, price will be lower for the flight in third and fourth month, as customer will take additional risk.

The destination to Warsaw has significantly one of the lowest price for the tickets from Kyiv. The duration time for the flight is 92 minutes. There are a huge number of students and workers, who lives in Poland. As a result, Warsaw can become the most attractive destination for Ukrainians.

The influence of COVID-19 has been estimated in this work. The price for airline tickets has decreased by 12% in the period of quarantine. However, customer has to spent additional fee on each flight, due to the rules of having a COVID-19 test result. The price for PCR test is 60 USD, according to the U.S. Embassy in Ukraine[19]. Therefore, the additional fee, which customer has to spent, is equal to 120 USD for round trip. As a result, the customer expenses on the trip is increased, which significantly decreased the number of passenger for the airline industry.

The problem of first period analyses can be the influence of COVID-19 on the whole industry. In this work it was assumed that person buy a ticket in the beginning of May, but all flights were canceled. Companies have sold their ticket on the same price as it was before, what is quite strange. However, purchasing on the same price add some benefits. For example, the passenger can take back his/her money even 3 hours before the flight. Also, some companies provide the additional free service of changing the ticket. If the flights were canceled due to the quarantine reason, company will save your money on the balance.

A lot of things has changes during the period from May to September. I had an online meeting with John Walton, Data Journalism Editor at BBC News. He has worked

[19] https://ua.usembassy.gov/news-events/

for BBC news from 1998 till now. According to John Walton, during the last decade, airline industry has been using algorithms for estimating the ticket price. Now, it does not work. The situation is unstable. The dataset for analyses has to include all flights for the whole region to have a clear understanding what is the new pricing strategy of the airline companies. Moreover, if we talk about post-soviet area, this task is very hard for being analyzed. The main reason is that there is no information.

To conclude, the whole industry has to be changed a lot due to the number of reasons. First of all, there is no tools which can predict the future demand for airline industry, as all data from the past cannot be used. Second reason is that the behavior of customers has significantly changed. Customers have to take additional risk during the traveling due to COVID-19. Third reason is the influence of new substitutes, such as internet and Hyperloop. Internet meetings have changed the business culture dramatically. Offline meetings were replaced by Zoom and Skype. All in all, the influence of factors which we analyzed will be changes significantly due to the innovation in the whole airline industry.

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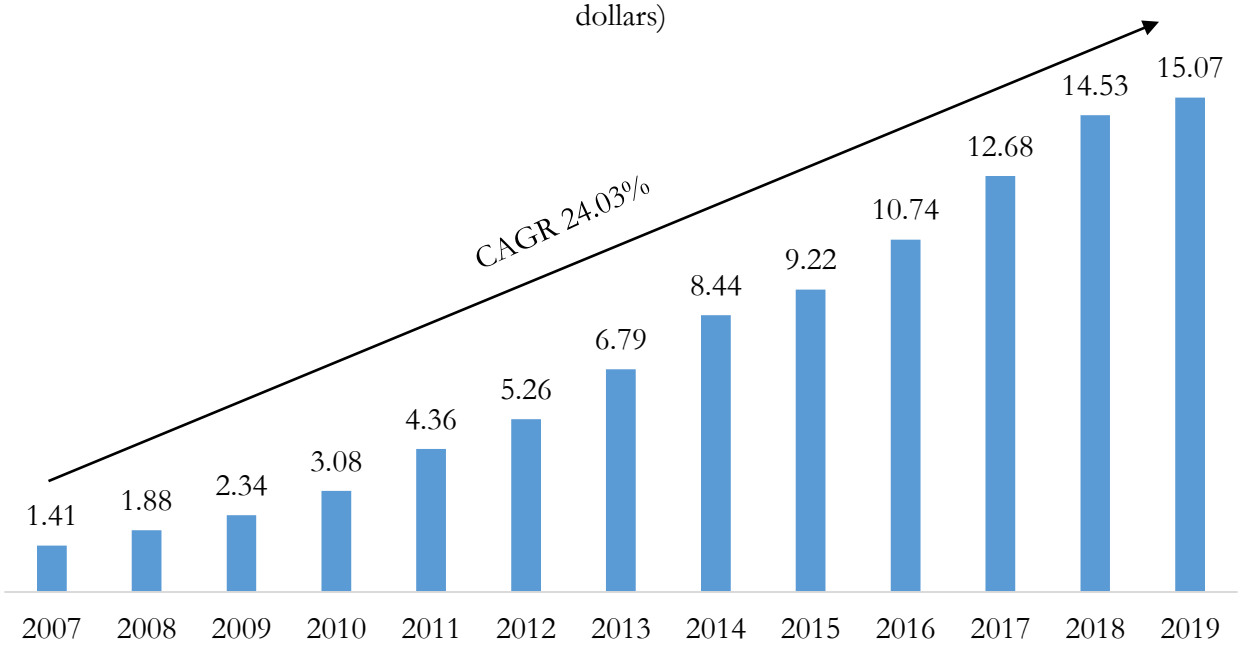
APPENDIX

Figure 6
Revenue of Booking Holdings worldwide from 2007 to 2019 (in billion U.S. dollars)



Source: statista.com

Figure 7
Changes in Price and Number of Flights

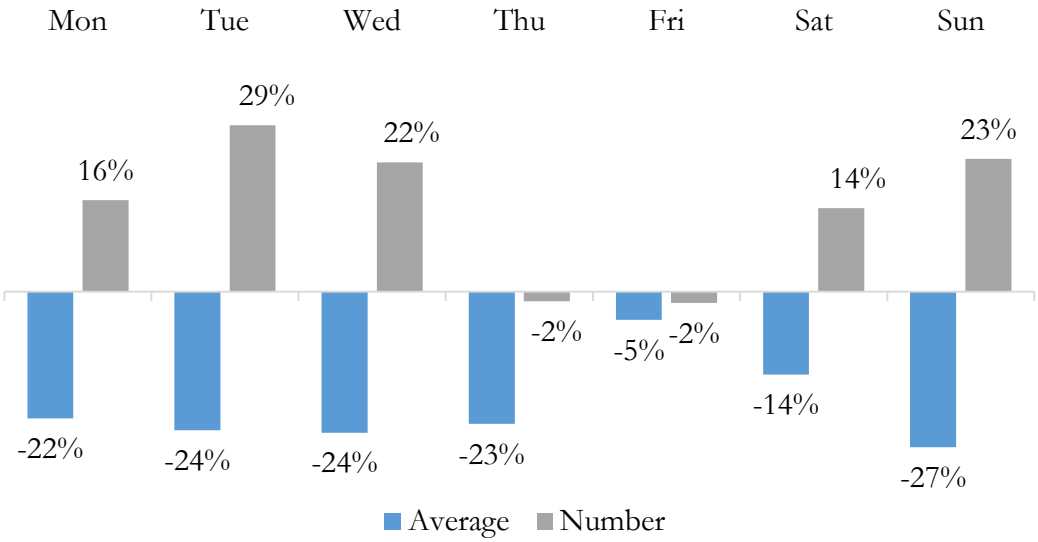


Table 7

Analysis of CR8 Concentration Ratio Between 2006-2015

REGIONS / YEARS	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Asia Pacific	37,1	37,1	38,4	38,4	40,2	41,3	40,6	38,9	38,3	37,1
Australia	72,7	74,8	70,6	68,2	72,5	67	71,2	72,5	69,9	67,8
Eastern Europe	42	40,2	43,4	43,4	46,5	49,3	59,1	61	59,8	56,2
Latin America	45,3	47,3	50,9	47,5	51,2	54,7	56,8	58,7	60,8	57
Middle East and Africa	40,8	39,3	39,5	39,9	41,9	44	46,1	46,1	47,7	46,7
North America	69	68,4	71,1	70,5	70,8	72,7	73,2	74,7	74,9	74,5
Western Europe	42,7	42,8	44,7	44,7	48	51,6	52,1	51,7	52	54,4
World	28,5	27,3	29,2	28,1	29,4	30,8	30,3	32,3	32,3	33,1

Source: Market Share, the Number of Competitors and Concentration: An Empirical Application on the Airline Industry, author Mehnet Yasar

Table 8

Analysis of HHI Concentration Ratio Between 2006-2015

REGIONS / YEARS	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Asia Pacific	238,84	227,35	247,73	243,5	256,27	274,88	267,97	250,87	246,14	235,68
Australia	2620,1	2691,94	2334,78	2152,2	2332,82	1811,55	1897,51	1939,9	1740,78	1613,1
Eastern Europe	367,12	310,19	350,28	327,05	385,69	431,72	745,11	809,85	812,98	729,51
Latin America	335,07	367,14	447,65	395,83	462,92	516,84	719,24	669,44	748,9	664,45
Middle East and Africa	317,13	278,87	271,91	275,09	320,63	368,06	442,85	458,44	513,42	514,73
North America	666,04	651,58	808,15	781,01	865,09	898,97	910,54	1078,28	1088,07	1068,91
Western Europe	394,83	380,44	416,72	430,51	485,01	537,14	520,21	501,56	498,49	542,43
World	147,83	139,77	154,15	149,35	160,48	169,8	167,55	179,44	179,9	185,39

Source: Market Share, the Number of Competitors and Concentration: An Empirical Application on the Airline Industry, author Mehnet Yasar

Table 9

Airbus aircraft 2018 average list prices (USD millions)

A220-100	81
A220-300	91.5
A318	77.4
A319	92.3
A320	101
A321	118.3
A319neo	101.5
A320neo	110.6
A321neo	129.5
A330-200	238.5
A330-800 (neo)	259.9
A330-200 Freighter	241.7
A330-300	264.2
A330-900 (neo)	296.4
A350-800	280.6
A350-900	317.4
A350-1000	366.5
A380	445.6

Source: www.airbus.com/

Table 10

Share of the market on the destination IEV-RIX

Airline company	**Number**	**Share**
Direct	453	19%
Ryanair, airBaltic	63	3%
LOT, airBaltic	75	3%
Wizz Air, Ryanair	126	5%
Wizz Air, airBaltic	330	14%
Turkish Airlines	109	5%
Ukraine International Airlines, airBaltic	173	7%
LOT	520	22%
Belavia	263	11%
Other	278	12%
Total	2390	100%

Direct flights	**Number**	**Share**
airBaltic	144	32%
Ukraine International Airlines	49	11%
Wizz Air	260	57%
Total	453	100%