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# Covid -19 pandemic and its impact on air carrier pricing

Sebastian Mako[*], Marek Pilat[*], Nikola Staricna[*], Peter Koscak*, Daniela Marasova[**]

[*] Technical university in Kosice, Faculty of Aeronautics, Department of air transport management, Rampova 7, 041 21 Kosice, Slovakia

[**] Technical university of Kosice, Faculty of Mining, Ecology, Process Control and Geotechnologies, Institute of Logistics and Transport, Park Komenského 14, 042 00 Kosice, Slovakia

sebastian.mako@tuke.sk, marek.pilat@tuke.sk, nikola.staricna@tuke.sk, peter.koscak@tuke.sk, daniela.marasova@tuke.sk

*Abstract*—**Covid-19 pandemic influenced whole world and also airline industry. Air traffic was suspended for several weeks. The resumption of air traffic has been accompanied by a number of hygiene measures to prevent the further spread of the above-mentioned virus. We can also prevent the spread of the virus by reducing the number of passengers on board the aircraft. However, this restriction has a direct effect on the load factor and thus the profitability of the airline. In this article, we focus on recalculating different scenarios with regard to limiting the number of passengers on board of the aircraft at the same time and we have calculated the change in air transport prices with respect to costs and these limitations. The individual scenarios either copy the limitation of the number of passengers on board and thus the price is directly proportional to this reduction, or the individual scenarios work with limiting number of passengers on board but the price for transport is inversely increased so that the air carrier covers the cost of the flight. Results of these calculations shows margins between prices in different scenarios. Paper also proposes the best possible scenario for calculation of ticket price.**

## I. Introduction

Pandemic situation caused by Covid-19 affected airline industry. Seasonality in Europe is biggest among world regions and therefore European region is affected by pandemic more than any other region in the world. Geopolitical influence is directly affecting the effectivity of the airline industry. Countries around the world have their own policies and rules how to fight pandemic and many countries canceled international flights in the beginning. Situation is also critical on board of the aircraft where several studies showed that air circulation on board helps to spread the virus. Several authors dealt with this topic and M. Keselova in Risk and opportunities in the process of flight delay said that flight delays represent a common problem in everyday air traffic practice. The impact of flight delay can be a risk and this risk represents financial losses, the dissatisfaction of passengers, time losses, loss of reputation and bad business relations. If an airline doesn't deal with this problem immediately, it will cause other problems [1,10]. Technological advances are not enough to reduce the negative impacts of flying, and behaviour change is needed. But for instance, decisions to keep older aircraft in service also slowed the efforts of airlines to reduce greenhouse gas emissions [2,3]. Other authors monitored specific routs and pricing policy of an airliner through the reference period. They presented in their study the development of the price on the given lines during reference period [4,5]. Authors also reviewed in the past Low-cost carriers and their impact in designated regions or worldwide. Their impact on a pricing policy was and still is significant but their product is different from that offered by legacy carriers [6,7]. Several authors also issued the other aspects that are currently influencing the development of air transport in various sectors. We can conclude that not only pandemic is influencing the development but also innovative activities in this field are changing the current perspective of air transport around the world technologies such as UAVs [8,9]. Modelling and simulation are useful tools used to describe several different possible scenarios in airline industry. We can model and simulate impact of selected variables on a price of airline ticket [11,12]. European world cities and the spatial polarisation of air transport liberalisation benefits where authors made scientific research about the influence of air transport liberalisation in the European Union [13,14]. The impact of airline differentiation on marginal cost pricing at UK airports Airport pricing is a central issue in international transport policies, which tend to support pricing schemes based on marginal operating costs [15,16]. The influence of competition on international sourcing strategies in the service sector where authors said that rising importance of service industries and international trade in services led to increased competition in the service sector [17,18]. Flying under the radar: Foreign firm visibility and the efficacy of political strategies in emerging economies where authors said that emerging markets hold great potential, foreign companies operating in those markets are exposed to a higher level of risk as compared to developed markets [19,20]. Authors presented in service quality delivery in a cross-national context that consumption of a wide range of services ranging from tourism to hospitality by an increasingly global mix of customers [21,22]. Authors said in model of passenger behaviour choice under flight delay based on dynamic reference point where that flight delay has always been a concern of scholars, but in previous studies, there has been little discussion of passenger behaviour choice after flight delay and it is necessary to gather information about passengers' decisions [24].

## II. METHODOLOGY

For the calculation of individual scenarios for the economic comparison of transport prices, we chose the Bratislava-Dublin line. The aircraft type for the calculation is the Airbus A 319 with a capacity of 156 passengers and division into only 1 class. To calculate the individual cost items, we used the available information for the type of aircraft and at the same time we compared our price range with real airlines so that our estimate is as close as possible to the real prices used by airlines on the above airline.

Calculated flight costs:

- Aircraft 2 467€
- Crew 836€
- Maintenance 2 827€
- Insurance 649€
- Fuel 4 893€
- Navigation fees 1 559€
- Airport fees 4 000€
- Crew per diems 205€
- Overhead ASK 1 552€
- Total costs 18 998€

We calculated the total cost of the flight at € 18,988. The total costs determined the basis for us to create a price range for a given airline. In the baseline scenario, we calculated a break-even point at 61% load factor. We then derived and calculated from the baseline scenario other scenarios affected by the change in the number of passengers on board the aircraft.

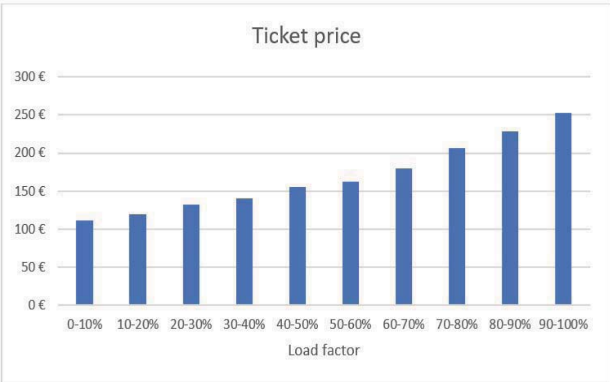


Figure 1. Ticket price

Figure 1 shows calculated ticket price range according to the load factor. This calculation provides us the baseline for other calculations that we did later on. The profit at 100% load factor was set at € 26,348.

## III. RESULTS

The price of a ticket is a basic and determining factor in the airline's profitability. After quantifying the cost of the flight, the airline will make a price range and determine the price for each seat block in the aircraft. The price gradually rises to a point until we reach a break-even point. At this point, the costs are equal to the sales of tickets. From this point on, the price rises at a more significant pace and allows us to make a profit.

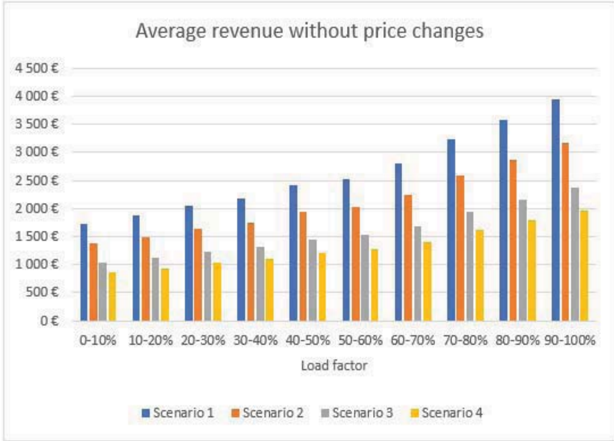


Figure 2. Average revenue without price changes

Figure 2 describes four different scenarios for limiting the number of passengers on board an aircraft. Scenario 1 is recalculated for the classic aircraft occupancy without restrictions and is therefore the basis for further calculations. Scenario 2 describes lower profitability in the sale of individual blocks. The price does not change, the capacity of the aircraft changes to 80% of the original capacity. Scenario 3 describes the same situation as scenario 2 but with a capacity reduction to 60% of the original aircraft capacity. Scenario 4 also describes the same situation as scenarios 2 and 3, but with a capacity reduction of 50% compared to the original aircraft capacity. The decline in sales is significant and the airline must respond in the event of a reduction in the number of passengers on board. The decrease in revenues is so significant that limiting the number of passengers to 80% of the original capacity of the aircraft will reduce revenues to such an extent that the resulting amount will just cover the cost of the flight.

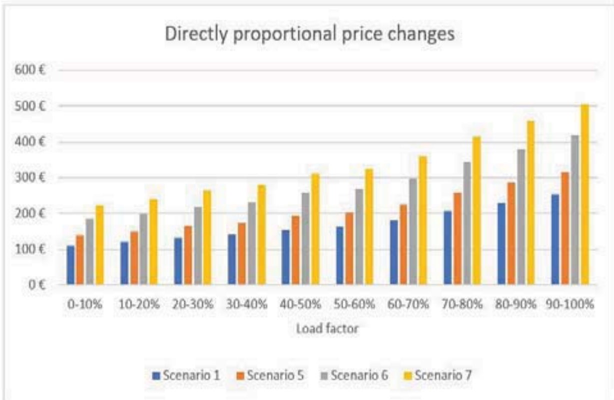


Figure 3 Directly proportional price changes

Figure 3 describes a directly proportional increase in the ticket price to the limited number of passengers on board the aircraft. Scenario 1 again describes a basic situation where the number of passengers on board is not limited. Scenario 5 points to an increase in the ticket price in direct proportion to a reduction in the number of passengers on board to 80% of the original capacity. The price increased in this scenario by 1.25 times the original price. An increase in the price by this value resulted in


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the same total sales as in scenario 1. Scenario 6, like scenario 5, points to an increase in the ticket price in direct proportion to the reduction in the number of passengers on board. In scenario 6, we expected a reduction in the number of passengers on board to 60% compared to the original capacity of the aircraft. The ticket price increased by 1.66 times the original ticket price so that we get the same total revenue as in scenario 1. Scenario 7, as in the previous scenarios, points to an increase in the ticket price due to the reduced number of passengers on board. In this scenario, we have reduced the number of passengers to 50% compared to the original capacity of the aircraft. We increased the ticket price by 2 times the original price so as to achieve the same sales as in scenario 1.

Rising prices in direct proportion to reducing the number of people on board have both pros and cons. The positive is that the price increases in direct proportion and the air carrier does not lose the profit from the airline. The downside is that such a price increase is too high from the customer's point of view and can result in a reduction in demand for transport. The air carrier should look for a compromise between the price of the ticket and the profit from the airline, especially at a time when the cash flow of the air carrier is significantly endangered.

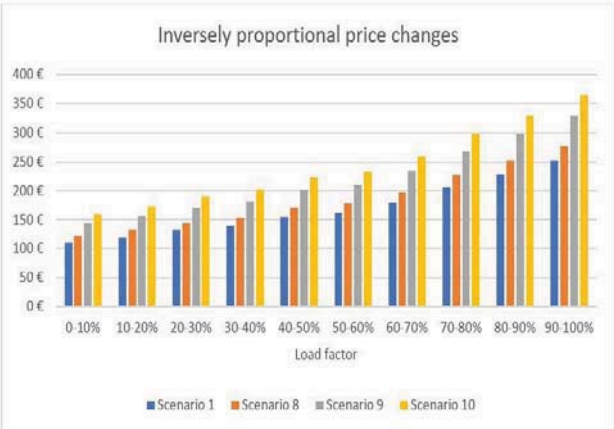


Figure 4. Inversely proportional price changes

Figure 4 describes the inversely proportional changes in ticket prices compared to the reduction in the number of passengers on board an aircraft. Scenario 1 is a baseline for deriving further calculations and describes ticket prices without changes. Scenario 8 describes a change in ticket prices due to a reduction in the number of passengers on board to 80%. The ticket price increased inversely by 1.1 times the original price. This change would result in a partial reduction in sales revenue, but at the same time the price would not rise too fast. Scenario 9 describes a change in ticket prices due to the limitation of the number of passengers on board the aircraft to 60% of the original capacity. The ticket price increased inversely in proportion to 1.3 times the original price. Scenario 10, like the previous scenarios, describes a change in the price of the ticket due to the reduction of the number of persons on board the aircraft to 50% compared to the original capacity. The price change is inversely proportional and is 1.44 times the original price. In Scenario 10, at the same time, the air carrier chooses a compromise between prices and revenues, given that with a 100% load factor, its revenues would cover the costs of the flight.

## IV. DISCUSSION

In the event of a reduction in the number of passengers on board, the air carrier has several options for resolving the situation and thus reducing the impact of hygiene measures on society. A directly proportional change in ticket prices to reduce the number of passengers on board is one of the options. However, the ticket price in this case will be many times higher than the normal price and the carrier runs the risk of reduced demand due to the high price of the ticket. The second option is to change the prices of tickets inversely proportional to the change in the number of passengers on board the aircraft. The air carrier will thus keep prices as low as possible and will not jeopardize demand as much as if it were adjusting prices in direct proportion to the reduction in the number of passengers.

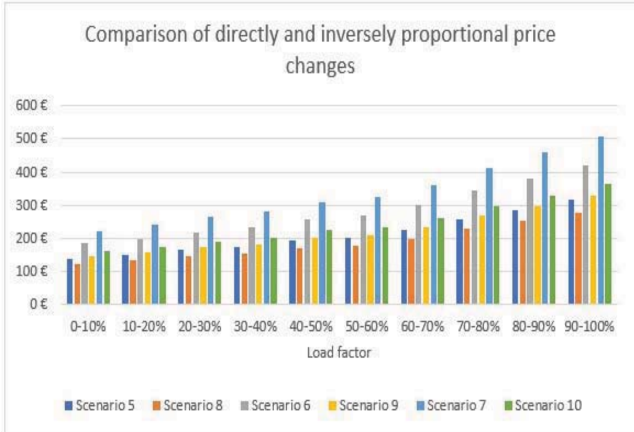


Figure 5. Comparation of directly and inversely proportional price changes

Figure 5 shows the differences between the prices of tickets in individual blocks for the two methods used. The direct price increase in Scenario 5,6,7 results in sales that would always be the same regardless of how the restrictions on the number of passengers on board the aircraft would change. The increase in indirect prices in Scenario 8,9,10 results in sales that would gradually decrease as restrictions on the number of passengers on board the aircraft increase. In a direct comparison between scenario 5 and 8 by limiting the number of passengers to 80% of the original capacity, it is clear that the difference between the individual prices in the blocks is not so great, mainly due to the fact that the limitation of the number of passengers is not so significant. By comparing scenarios 6 and 9, we see that the change in the number of passengers on board the aircraft compared to the original capacity already has a significant impact on the price. The total average difference between ticket prices is at the level of € 52.50. In a direct comparison between scenario 7 and 10 we can notice that the difference in ticket prices in individual blocks is significant with increasing load factor and at load factor 90 - 100% € 142. The total average difference between ticket prices is € 81.60.


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Table 1 Total revenue comparison

| Capacity reduction | No price changes | Directly proportional price changes | Inversely proportional price changes |
|---|---|---|---|
| 0% | 26 348 € | 26 348 € | 26 348 € |
| 20% | 21 113 € | 26 391 € | 23 224 € |
| 40% | 15 877 € | 26 355 € | 20 640 € |
| 50% | 13 174 € | 26 348 € | 18 971 € |
| Total revenue | 76 512 € | 105 442 € | 89 183 € |

The table total revenue comparison points to differences in sales at individual capacity limitations. The first column shows how the air carrier's revenues would develop if it did not respond to capacity limitations by changing the price of the ticket and thus how its revenues would fall. The second column describes how revenues would develop if the air carrier increased the price of the ticket in proportion to the capacity limitations. It is clear from the column that sales would not change, but as we mentioned above, it is questionable how a significantly higher ticket price would affect demand and, consequently, the sales of the air carrier. The third column describes how revenues would change for individual capacity limitations if we changed the price of the ticket inversely proportional to the capacity limitations. Revenues would visibly fall, but it is assumed that the price of tickets, which is significantly lower compared to the second column, would have provided the carrier with greater demand for transportation and also higher revenues. Comparison of four possible scenarios with different methods shows us the total revenue of these flights with load factor 100%.

## V. Conclusion

The Covid - 19 pandemic has significantly affected and continues to affect the day - to - day functionality of air transport. In our research, we focused on creating different scenarios for how an airline should proceed with a change in flight prices due to a possible reduction in the number of passengers on board the aircraft. Limiting the number of passengers on board an aircraft can result in reduced revenues from the sale of flights and therefore it is necessary to choose the right strategy to proceed so that the ticket price is not too high and unattractive for passengers but also to at least cover the cost of the flight.

In the article, we presented several options for how an air carrier can proceed and respond to this specific situation. The air carrier does not have to change ticket prices, but it itself runs the risk of high losses. Directly proportional change of the ticket price to limit the number of passengers on board the aircraft is the most profitable in terms of sales, but it carries with it the risk that prices will be too high and unattractive for customers. The inversely proportional increase in ticket prices due to the limitation of the number of passengers on board the aircraft is a compromise between the costs and revenues of the airline. During the Covid-19 pandemic, it is important for the air carrier to ensure a positive cash flow in the company and inversely proportional price increases is one of the possible solutions.

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