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EFFECT OF THE LOAD FACTOR ON THE TICKET PRICE

Summary. The factor of the aircraft load or sometimes simply called the load factor is the rate of capacity of the airline. It is also known as the efficiency measure and is therefore the most commonly used estimate to describe the performance of the airline. Achieving high load factor is considerably important for the profitability of the airline, and it is interesting to identify factors that could influence the factors of the aircraft load. To describe the problem of load factor and airfare, we chose the Airbus A319 aircraft on the Bratislava (BTS) and Larnaca (LCA) routes. The data we used to calculate the individual indicators are based on real resources and give us a clear example of how the load factor affects the ticket price.

1. INTRODUCTION

The factor of the aircraft load or sometimes simply called the load factor is the rate of capacity of the airline. It is also known as the efficiency measure and is therefore most commonly used to describe the performance of the airline. Achieving high load factor is considerably important for the profitability of the airline, and it is interesting to identify factors that could influence the aircraft load. In addition, the awareness of these factors helps organizations or companies to make effective decisions and improve planning. These decisions or planning could include providing training, changing thinking among airlines, increasing human resources, increasing investment in advertising and many others that can improve the performance of these companies.

Several authors have dealt with the subject, and as an example, the issue was mentioned in the study from passenger growth to aircraft movements, where the authors stated that airlines are able to deal with passenger growth by increasing either the frequency or the aircraft size, which may entail different numbers of aircraft movements. Forecasting the latter is necessary for evaluating technologies, approaching future emissions, or anticipating capacity constraints [3]. The effect of load factor on the European market has been stated in Spectral density estimation of European airlines load factors for Europe-Middle East and Europe-Far East flights. In the airline industry, the term load factor is defined as the percentage of seats filled by revenue passengers. The load factor is a metric that measures the airline's capacity and demand management [8]. Connection with the load factor is reported in the study Airline Route profitability analysis and Optimization using BIG DATA analytics on aviation data sets under heuristic techniques, where we can see that the application of vital decisions for new airline routes and aircraft utilization represents an important factor for airline decision making. Analysis should be done based on key criteria, identified by operational needs and load revenues from operational systems, e.g., passenger, cargo, freights, airport, country, aircraft, seat class etc. [2]. Discounting effect has been reported in Personalization in airline revenue management - Heuristics for real-time adjustment of availability and fares, where the authors state that of particular interest is "dynamic discounting," which increases both yields and load factors by offering targeted discounts to leisure passengers in specific situations [9]. Airline quality, load factors and performance is a study in which the authors state that performance in the airline industry can be measured by traditional input/output ratios such as the ratio of operating income to operating cost, financial measures such as ROI, or non-financial measures such as passenger load factors [5]. Predicting airline passenger load: A case study is another study where the authors state that airline industry has been growing at an outstanding rate with an annual growth rate about 6% worldwide in passenger load for the past decade. Airport transport industry around the globe has faced extreme challenge of handling high volumes of passengers especially in Asia owing to the economy growth, and most of them are already operating at 80% - 90% of their capacity in the recent year [4]. In Straight and level: Practical airline economics, third edition, the chapter 4 concludes the book by exploring relationships between unit revenue, unit cost, yield, and load factor [1]. The article Cyclical dynamics of airline industry earnings instead finds that aggressive use of yield management - varying prices to ensure high load factors (capacity utilization) - may have an unintended effect on increasing earnings through variances in increasing the sensitivity of profit to changes in demand [6].

2. METHODOLOGY

To describe the problem of load factor and airfare, we chose the Airbus A319 aircraft on the Bratislava (BTS) and Larnaca (LCA) routes. The data we used to calculate the individual indicators are based on real resources and give us an example of how the load factor affects the ticket price. We have chosen this track because this route does not exist and therefore offers us a possible vision for the future to predict whether the route would look financially feasible. The distance between the two destinations is 1992 km. Larnaca is also a popular resort and an ideal destination for the summer season.

For calculation of the load factor, we use a simple formula that combines the number of passengers, the distance, and the offered seating capacity.

$$\text{Load factor} = \frac{\text{Revenue passenger miles}}{\text{Available seat miles}} \times 100\%$$

Fig. 1. Load factor calculation

Pruša [7] describes the use of the passenger/seat load factor (SLF) as one of the key parameters describing the success of the subject on the market and the adequacy of the deployed capacity (with a logically close link to the adequacy of the costs incurred). It is counted as a percentage of the used passenger miles (RPM) and the offered passenger miles (ASM) and has several possible impressions, for example, for the whole company, for aircraft types, transport geographic areas, or even for individual lines or cumulative lines. Typical carriers usually range from 70% to 80% SLF, long-distance flights, and low-cost and charter carriers. Pruša states that in addition to low-cost carriers, for which, for several reasons, the high level of SLF is often the direct goal and the cost of stimulating demand through aggressive pricing, SLFs may reach 90% on certain lines to indicate the problem of either unnecessarily low prices or non-demand, which may lead to the threat of new competition. The Chi-Quadrat-Test distribution has a very important status and use in mathematical statistics. It is most often used to determine estimates and interval estimates of unknown parameters and to test statistical hypotheses. This test uses critical values that are tabulated, and based on them, we can accept or reject the tested statistical hypothesis.

$$\chi^2 = \sum_{i=1}^{k} \frac{(X_i - Np_i)^2}{Np_i}$$

Fig. 2. Chi-Quadrat-Test calculation

Methods used:
• Data summary
• Analysis
• Synthesis
• Chi-Quadrat-Test

2.1. Flight Costs

Flight costs are a sum of all the costs associated with operating the aircraft at 1 round to the destination. These costs also include the transport of airport passengers, insurance, and maintenance, which are the indirect operating costs.

Breakdown of individual BTS-LCA flight costs is as follows:

• Aircraft	2 967€
• Crew	836€
• Maintenance	3 827€
• Insurance	649€
• Fuel	6 893€
• Navigation fees	1 559€
• Airport fees	5 000€
• Bus transfer	1 932€
• Crew per diems	205€
• Overhead ASK	1 552€
• Total price	25 420€

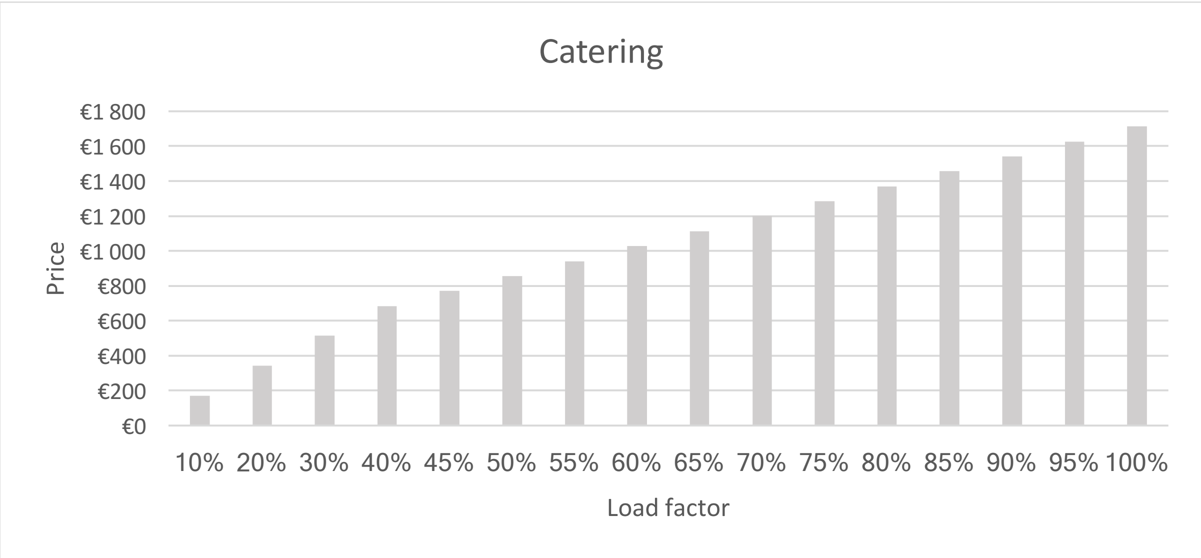

Fig. 3. Catering chart

The catering chart shows a gradual increase in the cost of refreshments on board of the aircraft. Catering is directly dependent on load factor. We can see an increase in prices from 10%, where the price ranges from 171 euros to 100%, with a price of 1712 euros, for catering. However, this cost does not directly affect the total cost associated with the actual flight, since catering costs increase with the number of passengers and they are not fixed.

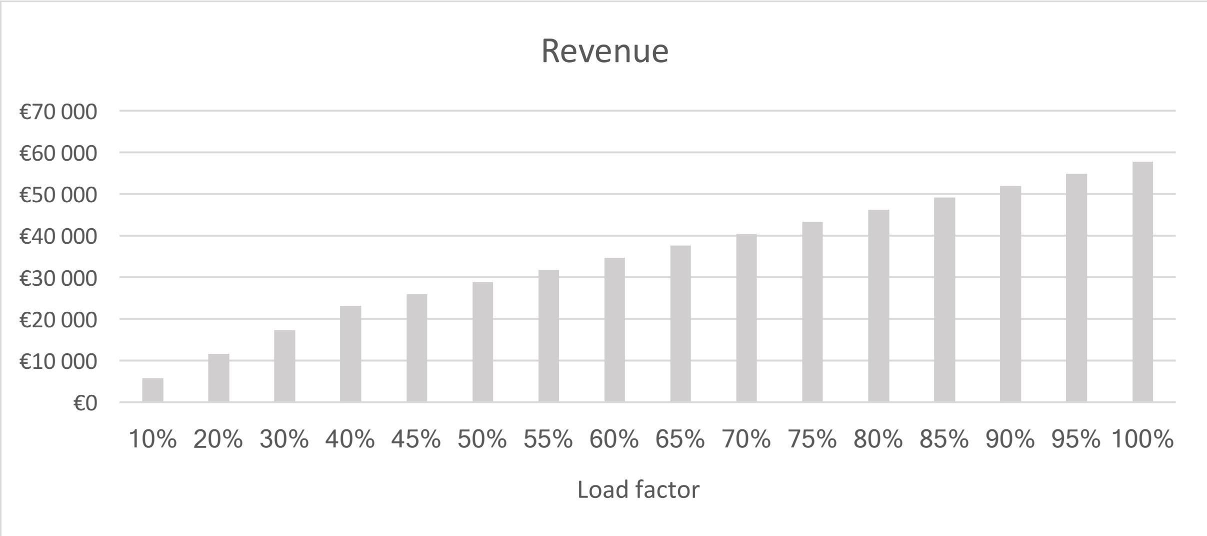

Fig. 4. Revenue chart

The revenue graph shows a gradual increase depending on load factor. Revenue tracking from their initial state is important for determining route profitability. The chart shows revenue growth from 10%, where revenue ranges from € 5772 to 100% at € 57,720.

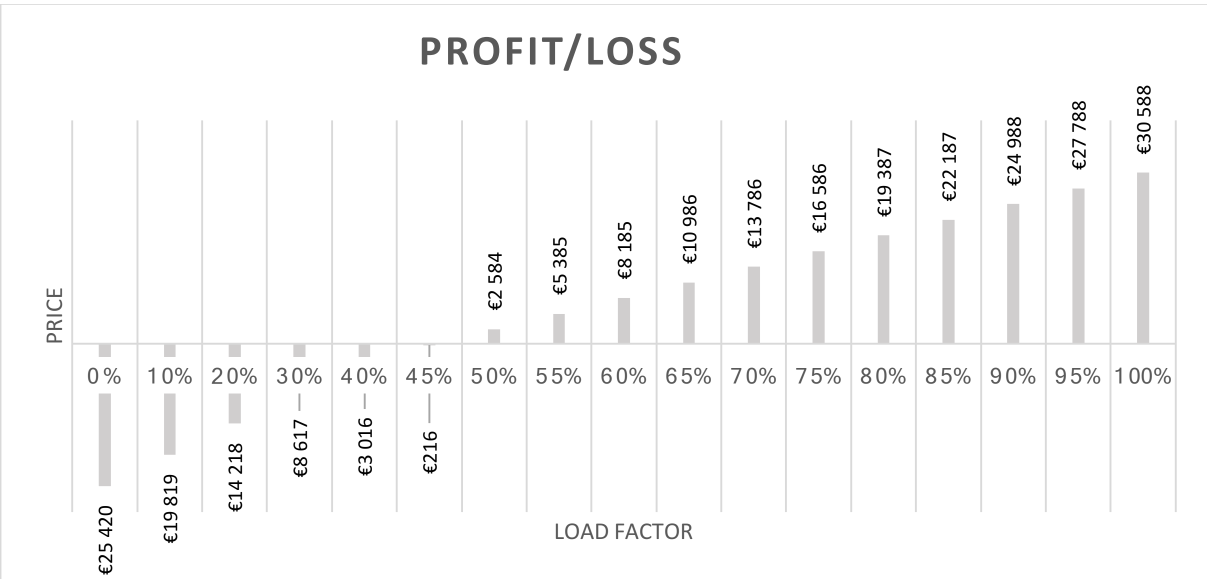

Fig. 5. Profit/loss chart

The Profit/Loss graph shows the gradual coverage of the costs of running the route. The initial condition is the loss at 0% calculated at € 25,420 which are the total costs of the flight. A gradual increase of the load factor in the graph shows the loss reduction to the point where the load factor is 46%. At this point, we achieve a breakpoint and the route operations begin to be profitable. In an ideal state when we have a load factor of 100%, the profit is equal to € 30,588.

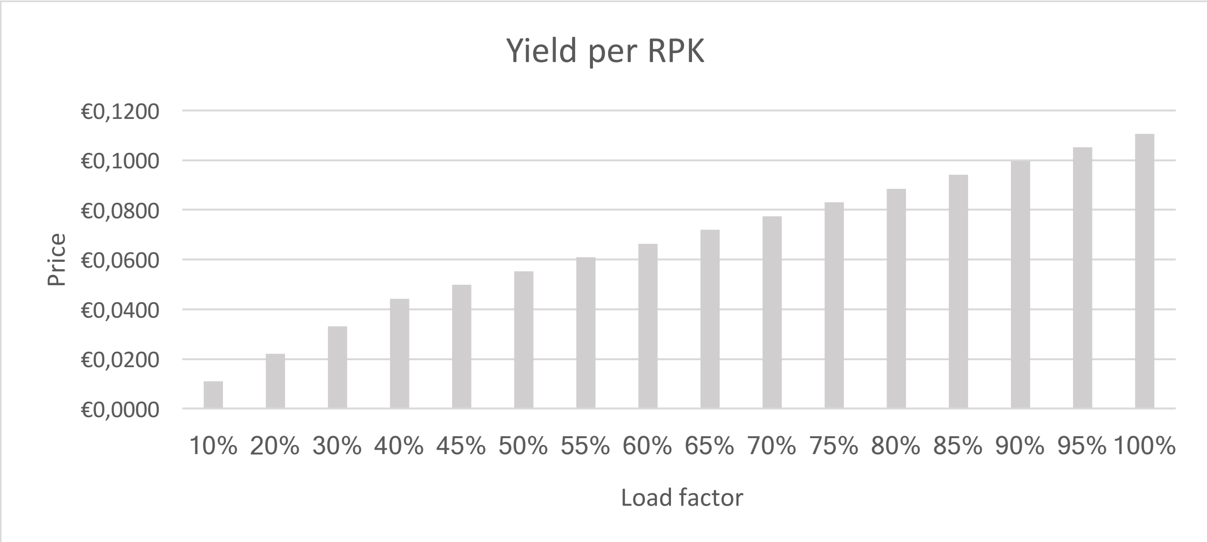

Fig. 6. Yield per RPK chart

Revenue per passenger kilometer represents the average amount the passenger pays for one kilometer. It is usually displayed in cents per kilometer and is useful for assessing price changes over time. Yields per passenger kilometer may also be used to compare performance between markets or airlines, but must include a load factor. The cost of 1 passenger kilometer is the commonly used unit cost in the aeronautical industry, expressed in cents per passenger kilometer, and is determined by the division of operating costs. This number is often used to compare costs between different airlines or for the same airline in different time periods. A lower cost per passenger kilometer means that it is easier for the airlines to achieve profit on a route and a good assumption of a lower breakpoint. The low value of the costs does not guarantee profitability of the route.

Our chart shows their direct dependence on load factor. Their gradual increase starts at 10% where they are at the level of € 0.0111 per person-kilometer, but that does not cover the costs at that point, which are quoted at € 0.0490. Thus, with a 10% load, we are talking about a significant loss. Route operation begins to be profitable at load factor of 46% which is the breaking point and the revenue per passenger kilometer in the amount of € 0.0509 exceeds the cost per passenger kilometer of € 0.0502. The ideal condition is always when the route load is 100%, where the revenue of € 0.1106 more than twice exceeds the costs of € 0.0520. The chart also shows how amounts of costs and revenues per person-kilometer are different from the beginning to the end. The cost graph rises at a moderate rate of 0.0003 € every 10%, which means that the difference between the initial amount of € 0.0490 and the final amount of € 0.0520 is very small. The revenue graph, on the other hand, rises at a much higher rate with a constant of € 0.0010 every 10%, which makes the difference between the initial amount of € 0.0111 and the final amount of € 0.1106 much more pronounced than the cost graph.

The operating income ratio indicates how much revenue a company can generate after paying variable production costs, such as wages and raw materials. The graph shows the operating revenue on the BTS-LCA route. At the lowest point of the graph, with a total load of 10%, we can see a loss of 343.36%, indicating the lowest possible revenue on a route. Breakpoint occurs at a load factor of 46%. At this point, the operating profit margin is 1.30%. The ideal condition is when the load is 100%, with an operating profit margin of 52.99%.

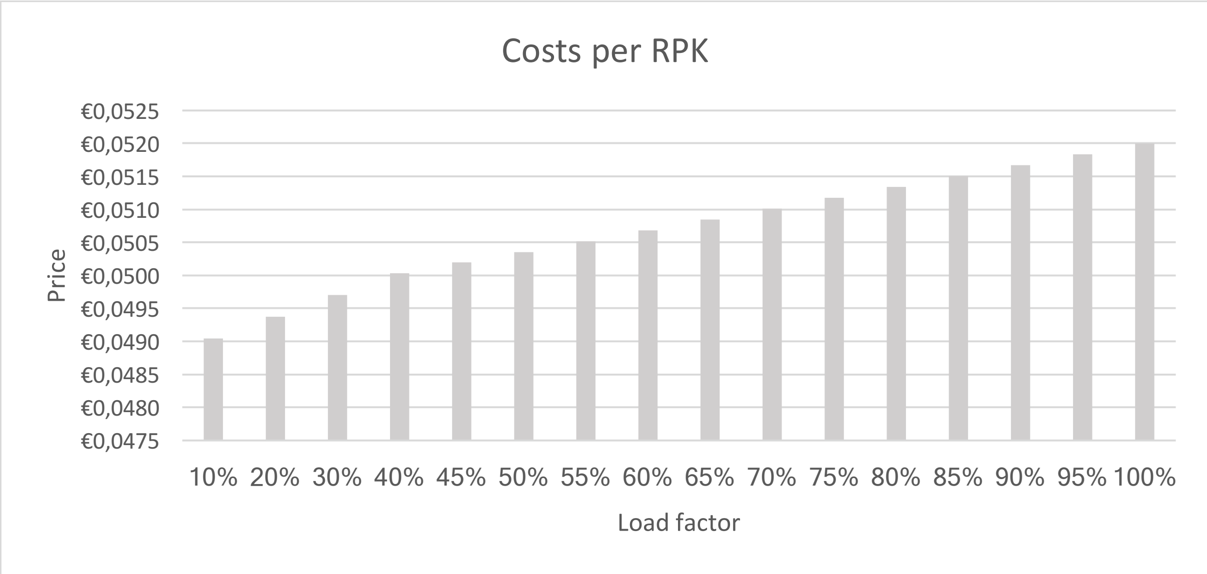

Fig. 7. Costs per RPK chart

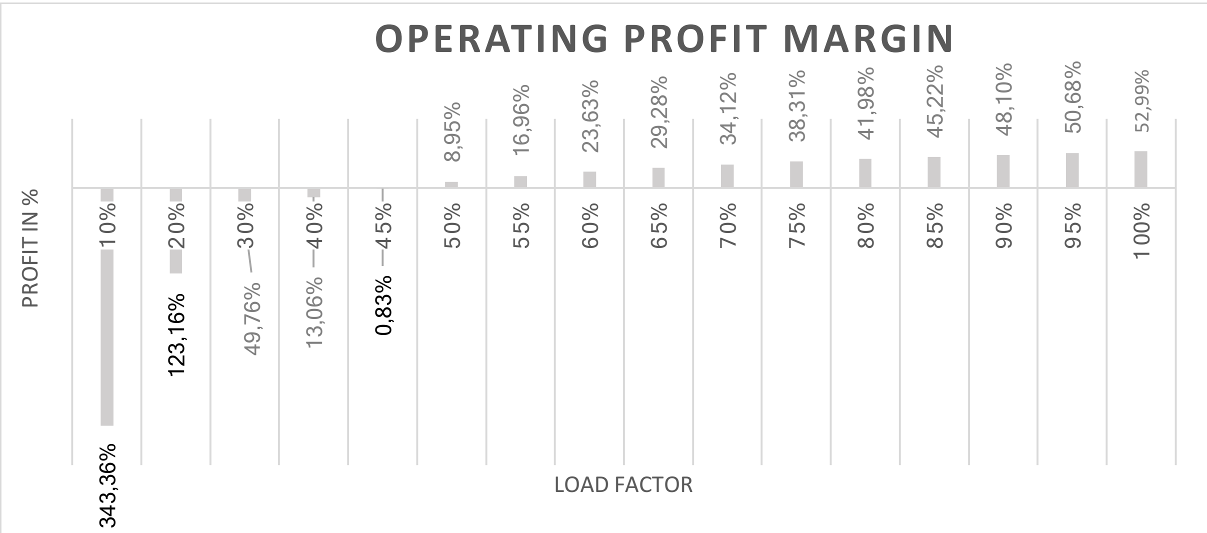

Fig. 8. Chart of Operating margin profit

2.2. Breakpoint

Breakpoint or equilibrium level is the amount when sales are high enough to cover the total costs. Total profit at breakpoint is zero. The company can only achieve this if the lower value of the sale is higher than the variable price per unit. This means that the sale price of the goods must be higher than the price paid by the company for the goods or its components to cover the original price paid - variable costs. Once they break the breakpoint, the company can start making a profit. In our case, after we analyzed the input data, we find that the break point occurs at a time when the load factor is 46%.

Conversion of indicators at breakpoint:

- Total costs 25 420€
- Catering 788€
- Revenue 26 551€
- Profit 344€
- Yield pre RPK 0,0509€
- Costs per RPK 0,0502€
- Operating profit margin 1,30%

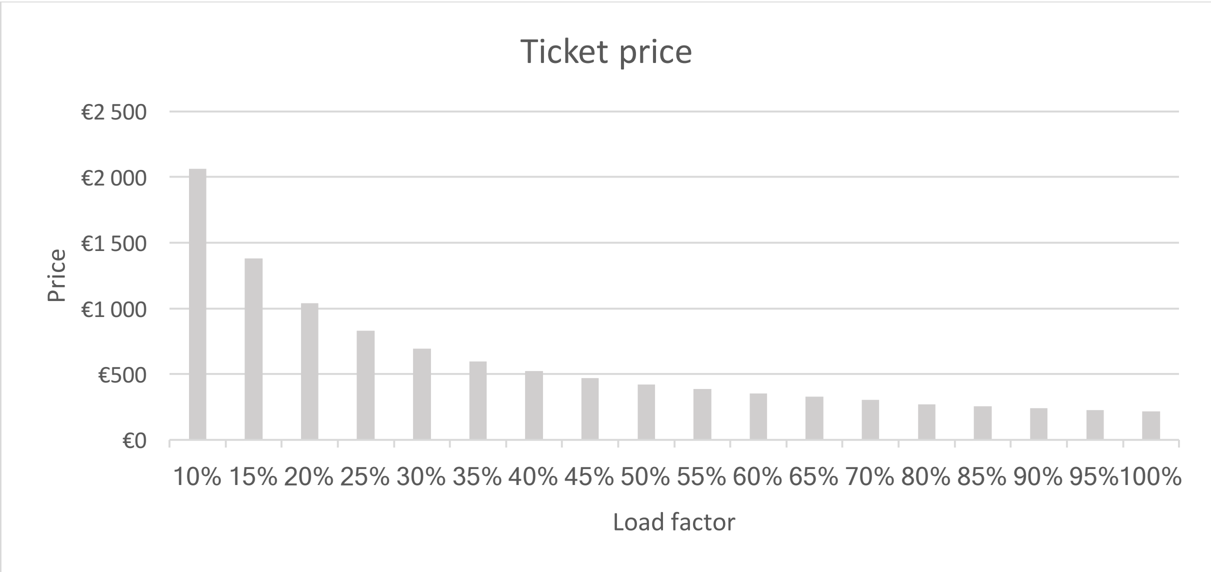

Fig. 9. Chart of Ticket price

The chart shows the level of the ticket price for a given aircraft expense to cover the operating costs. The graph shows that the price starts at 2 062 €. At this moment, the aircraft is loaded to a maximum of 10%. The slight development of prices is marked up to the breakpoint when the aircraft load is 46%. From this point, the price has a more pronounced downward character. The most significant differences are between the load of 15% where the price is 1 379 € and the load, which is approaching 30% at the price 695 €. This price range is based on the pricing policy of pricing on a route.

3. DISCUSSION

An important point for any airline is to get just the breakeven point, which means to load the plane such that the revenue equals the cost of running it on that route. After exceeding this point, the ticket price can be changed in many ways. Sometimes we can see prices going up or down very quickly, but air carries manage their yield management efficiently. There are few reasons how this does work in the air transport sector:

- Sale services are based on the long run and the airline is able to correct the price in the way it needs.
- Tickets are sold for a certain number of seats for a same price. Once the tickets in the given price category sell out, their price will rise or go bit lower slightly.
- In the last days of sale, the price is at its lowest, because many air carriers are trying to sell as many seats as possible.

Based on the analysis of these data, we found a significant impact of the load factor on the ticket price. This effect is depicted using a graph where it is seen that the price rises along with the aircraft's load. For the mathematical reasoning of this analysis, we chose a Chi-Quadrat-Test.

Table 1

Chi-Quadrat-Test calculation

Ticket Price	**Expected value**	**Real value**
€2 062	19%	5%
€1 379	13%	5%
€1 037	10%	5%
€832	8%	5%
€695	7%	5%
€598	6%	10%
€524	5%	5%
€468	4%	5%
€422	4%	5%
€385	4%	5%
€354	3%	5%
€327	3%	5%
€305	3%	10%
€268	3%	5%
€253	2%	5%
€240	2%	5%
€228	2%	5%
€217	2%	5%
Total	100%	100%

Based on the Chi-Quadrat-Test calculation, we verified the hypothesis that at the level of significance $\alpha = 5\%$, the total value of chi = 0.999999998. This value confirms the established hypothesis that there is a strong interconnection between the load factor and the ticket price.

The largest operating cost areas for the airlines, on average, are the companies' fuel expenses and those expenses related to the procurement of oil. When oil prices are increasing in the global economy, it is natural that the stock prices of airlines drop. When oil prices decline in the economy, it is equally natural that the stock prices of airlines go up. Fuel costs are such a large part of an airline's overhead percentage-wise that the fluctuating price of oil greatly affects the airline's bottom line. To protect themselves from volatile oil costs, and sometimes to even take advantage of the situation, airlines commonly practice fuel hedging. They do this by buying or selling the expected future price of oil through a range of investment products, protecting the airline companies against rising prices. This strategy entails a risk in the event of unexpected changes in oil prices, which can significantly affect the company's pricing policy and lead to a disadvantage in the market.

Aggressive price increases after reaching a breakeven point, which allows the airlines to raise prices at their own discretion. The prices of the company must still be interesting for the customer. The air carrier must have its pricing policy adjusted to attract the customer at a higher price, and the passenger should not prefer another carrier for a lower price at the costs of a later arrival to the destination.

4. CONCLUSION

The factor of the aircraft load or sometimes simply called the load factor is the rate of capacity of the airline. It is also known as the efficiency measure and is therefore most commonly used to describe the performance of the airline. To describe the problem of load factor and airfare, we chose the Airbus A319 aircraft on the Bratislava (BTS) and Larnaca (LCA) routes. The data we used to calculate the individual indicators are based on real resources and give us a clear example of how the load factor affects the ticket price.

An important point for each airline is to get just the breakeven point, which means to load the plane such that the revenue equals the cost of running it on the route. Using input data analysis, we determined the significant impact of the load factor on the ticket price. This effect is illustrated by a graph where it is seen that the price rises along with the load factor.

An important factor that still affects the scope of this work is that an analysis that has been calculated and justified by multiple approaches is that this work is applicable to only one line with inputs such as price and load factor.

The impact of the load factor and the cost of the ticket is one of the most important indicators in air transport. Further research in this area is necessary for better understanding of the pricing of air carriers.

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