

Airlines Data Analysis Using SQL and Python

Business Problem : Our company operates a variety of aircraft, from small business jets to medium-sized planes. We have been providing top-quality air transportation services to our clients for many years, with a primary focus on ensuring a safe, comfortable, and convenient journey for our passengers.

However, we're currently facing challenges due to several factors, including strict environmental regulations, higher flight taxes, increased interest rates, rising fuel prices, and a tight labor market, which has led to higher labor costs.

As a result, our company's profitability is under pressure, and we are looking for ways to address this issue. To tackle this challenge, we plan to analyze our database to find ways to increase our occupancy rate, which could help boost the average profit earned per seat.

Objectives

1. Increase Occupancy Rate: By filling more seats on our flights, we can raise the average profit per seat and help reduce the impact of the challenges we're facing.

2. Improve Pricing Strategy: We should create a pricing plan that considers changing market conditions and customer preferences to attract and keep our customers.

3. Enhance Customer Experience: We need to ensure a smooth and convenient experience for our customers, from booking to arrival. This will help us stand out in a competitive industry and build customer loyalty.

The main goal of this task is to find ways to increase the occupancy rate on flights that aren't performing well. By doing so, we can ultimately boost the airline's profitability.

Analysis

The basic analysis of data provides insights into the number of planes with more than 100 seats, how the number of tickets booked and total amount earned changed over time, and the average fare for each aircraft with different fare conditions. These findings will be useful in developing strategies to increase occupancy rate and optimize pricing for each aircraft.

Table 1. Shows the aircraft with more than 100 seats and the actual count of the seats.

Aircraft_code	Number of seats
319	116
320	140
321	170
733	130
763	222
773	402

To better understand the trends in ticket bookings and the revenue earned from them, we used a line chart. The analysis shows that the number of tickets booked gradually increased from June 22nd to July 7th, then remained fairly steady until August. There was a noticeable peak during this period, with the highest number of tickets booked on a single day.

It's important to note that the revenue earned by the company is closely linked to the number of tickets booked, so the trends in revenue follow a similar pattern. These findings suggest that it could be useful to explore the factors that led to the peak in ticket bookings. This could help us increase overall revenue and improve our operational strategies.

After calculating the average costs associated with different fare types for each aircraft, we created a bar graph to visually compare the data. The graph shows information for three fare types: Business, Economy, and Comfort. It's important to note that the Comfort class is only available on one aircraft, the 773, while the CN1 and CN2 planes only offer Economy class.

When comparing the different pricing conditions within each aircraft, the graph consistently shows that Business class fares are higher than Economy class fares. This trend is consistent across all planes, regardless of the fare conditions.

Analyzing occupancy rate

Airlines need to carefully examine how full their flights are to maximize profits. Important numbers to look at include the total yearly income and the average revenue earned from each ticket for different aircraft. By understanding these figures, airlines can see which aircraft and routes make the most money and adjust their operations to be more profitable. This analysis can also help airlines find ways to improve pricing and better allocate resources to the most profitable routes. Figure 4 below shows the total revenue, number of tickets sold, and the average revenue per ticket for each aircraft.

The aircraft with the highest total revenue is the SU9, and as shown in Figure 3, it has the lowest prices for both business and economy class. This could explain why so many people bought tickets for this aircraft—its lower cost made it more attractive compared to others. On the other hand, the aircraft with the lowest total revenue is the CN1. A possible reason for this is that it only offers economy class tickets at a very low price, which might be due to its poor condition or fewer amenities, making it less appealing to passengers.

The average occupancy per aircraft is another important figure to pay attention to. By looking at this metric, airlines can see how well they are filling their seats and identify ways to improve occupancy rates. Higher occupancy rates can lead to increased revenue and profitability by reducing the costs associated with empty seats. Factors like pricing strategies, flight schedules, and customer satisfaction can all impact occupancy rates. Figure 5 below shows the average number of seats booked compared to the total number of seats for each aircraft. The occupancy rate is calculated by dividing the number of booked seats by the total number of seats available.

Airlines can estimate how much their annual revenue could increase by raising the occupancy rate of all aircraft by 10%. This analysis helps airlines understand the financial benefits of improving occupancy rates and whether it's a viable strategy. By optimizing pricing strategies and other operational factors, airlines can boost occupancy rates and revenue while also providing better value and service to customers. The figure below shows how total revenue increases with a 10% boost in occupancy rate, indicating that revenue will rise steadily. This suggests that airlines should pay closer attention to their pricing strategies.

Conclusion

Analyzing revenue data, such as total revenue per year, average revenue per ticket, and average occupancy per aircraft, is crucial for airlines to increase profitability. By examining these factors, airlines can identify areas that need improvement and adjust their pricing and route strategies. A higher occupancy rate is particularly important for boosting profitability because it helps airlines maximize revenue while reducing the costs of empty seats.

Airlines should also reconsider the pricing for each flight. If ticket prices are too low or too high, it could be why people aren't buying tickets. Prices should be set reasonably, taking into account the condition and amenities of the aircraft—neither too cheap nor too expensive.

However, increasing occupancy rates shouldn't come at the expense of customer satisfaction or safety. Airlines need to balance making a profit with providing good service and maintaining safety standards. By using data to guide revenue analysis and make informed decisions, airlines can achieve long-term success in a competitive industry.

