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As the COVID-19 pandemic quickly spreads around the world, we are particularly interested in the impacts of the pandemic on the aviation industry. Before diving into any data, our group first made some predictions on what could potentially affect the industry during the outbreak based on our personal experiences. First, we predict that there would be a significant increase in the number of flight cancellations due to strict travel restrictions and closing borders. Second, we predict there would be a severe drop in passenger traffic due to people's diminished willingness and demand to travel.

Since the mid-March, the total number of confirmed cases continued to rise throughout April, whereas the number of flights decreased sharply beginning mid-March and remained low throughout April. This data gives us a general idea on the trend of air traffic as the pandemic progressed. This confirmed our prediction about the contracting air travel volume as a result of the pandemic. However, we could not find sufficient statistics about the amount of flight cancellations.

Proceeding from the falling air traffic volume, we wanted to further explore its effects on the financial situations of airline companies. We decided to focus on the three main airlines companies in the United States: American Airlines, United Airlines, and Delta Airlines. We looked at the first quarter passenger revenue of the three airlines over the past 5 years, and we observed that the first quarter passenger revenue increased from 2016 to 2019 but experienced a significant drop this year. But what caused this significant drop? To find an answer to this question, we continued to examine the number of travelers in the U.S. We used data provided by Transportation Security Admission and found that the average number of U.S. and foreign carrier customers traversing TSA checkpoints per day during 1st March and 3rd May was on average 74% lower in 2020 than in 2019.

Due to the limited available resources and datasets, our group decides to focus on the influence of Covid-19 on the total number of flights and therefore to make a prediction about the future trend of total number of flights through model construction. First of all, we try to analyze the relationship between the increased number of Covid-19 confirmed cases per day and the number of total flights per day. Based on the plots of Covid-19 and flight number, we realize that there is a delay of Covid-19's effects on the number of flights, which we assume to be acceptable and realistically justified. Therefore, we make an assumption that there is a 3-day delay. However, the residual plot of the model with increased number of confirmed cases as the independent variable and flight number as the dependent variable exhibits a quadratic form, which proves that this model is not valid for analysis. Therefore, we use the log of flight number as the dependent variable, and the model turns out to be more accurate with high R squares, low p-value, and valid residual plot and q-q plot. Consequently, we use this model as the basis of our simulation to predict flight number for two weeks. After the flight number resource has been updated, we compare our prediction with the realistic values to examine the validity and accuracy of our predicted model. The result is not completely optimal because the predicted values and realistic values differ in their magnitude, which can be ascribed to some missing determinant elements, such as political policy, public attitude, and even time factor. However, the trends of both the predicted and realistic values seem to be highly consistent, which suggests that the increased number of confirmed cases on that day can potentially influence the trend of flight number in three days. Even though the absolute number is not accurate, the general tendency could be predicted.

Sources:

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