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An Empirical Analysis of the Impact of COVID-19 on Air Transport Industry

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Abstract

Since 2020, with the outbreak of COVID-19 around the world, the global health system is nearly collapsed, and the development of countries has come to a standstill. Countries have taken anti-epidemic measures, including restricting the movement of people, "sealing cities" and other measures that lead to the decrease of people's mobility. This makes the air transport industry faced with unprecedented difficulties. The purpose of this report is to verify the impact of COVID-19 on the global air transport industry. Through the collection of reliable data, the relationship between COVID-19 and the global air transport industry was empirically analyzed, and the association of indicators were compared through regression models.

Keywords

COVID-19; Air Transport Industry; Regression Model.

1. Introduction

As the development of the air transport industry is affected by the movement of people, the greater the mobility of people, the better the development of the air transport industry. However, relevant policies issued by various countries in the face of the COVID-19 outbreak just reduce the mobility of people (Chen, 2020). Maogong Zou (2020) pointed out that the COVID-19 outbreak has had a huge impact on the air transport industry. In conclusion, according to the literature, there is a negative correlation between COVID-19 and the air transport industry.

To verify the above relationship, this report proposes two indicators to measure the relationship between COVID-19 and the air transport industry. Since the number of flights with flat changes fluctuates greatly during the epidemic (You, 2020), Yanwei Li, et. al. (2020) uses the number of flights as an indicator to measure the development of the air transport industry. Moreover, Zongxian Feng (2020) considers new confirmed cases can be used as an indicator of the severity of COVID-19. Therefore, this report will use these two indicators to conduct the following empirical analysis.

2. Data Source and Treatment

After determining the direction of analysis and the selected indicators, this report gets a lot of reliable data. The cumulative number of confirmed cases worldwide each day from January to November 2020 was obtained from GitHub (2020). Meanwhile, the number of daily flights around the world in 2019 and 2020 were obtained from Flightradar24(2020). However, there are so many data from January to November that quantitative analysis is difficult. In other reports, the data is processed by month and finally becomes 11 sets of data. However, such data are not only too few and unrepresentative, but also prone to outliers, leading to inaccurate correlation judgment. Different from method of this data treatment, this report selects March when the COVID-19 broke out in a large scale in the world, and finally keeps 31 sets of data

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within one month. Such processing not only effectively reduces the size of data, but also retains enough data for quantitative analysis.

In addition, since the cumulative number of confirmed cases can not directly reflect the changes of the COVID-19. This report uses the difference between two adjacent days (the next day minus the previous day) to obtain the number of new confirmed cases per day in March.

3. Quantitative Analyses

3.1. Trend Analysis of the Two Indicators

To better observe the trend of the number of new confirmed cases per day and the number of daily flights in March. The report charts the trends of two indicators in March.

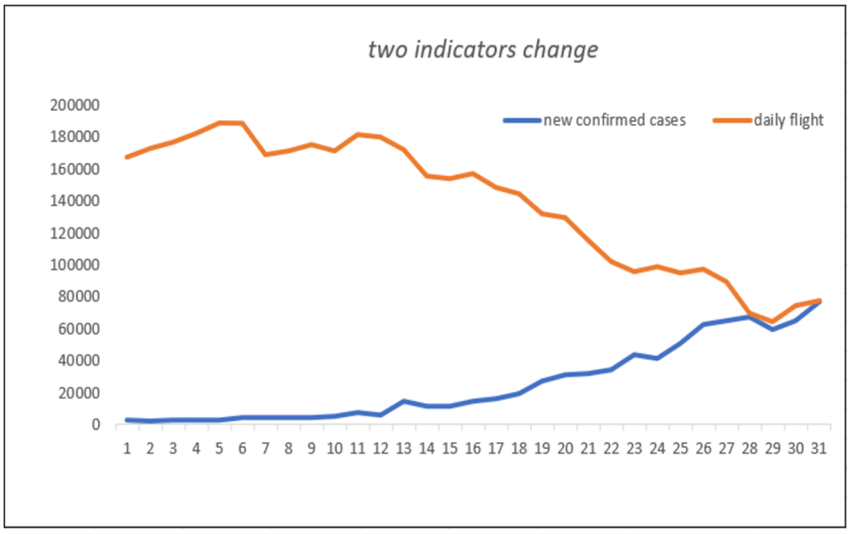

Figure 1. Tendency chart of two indicators

According to Figure 1, it can be observed that in the general trend, the number of new confirmed cases per day is gradually increasing over time, while the number of daily flights is decreasing and decreasing faster and faster. To some extent, such a trend of increase and decrease shows the correlation between these two indicators, and the number of flights per day is decreasing as the number of new confirmed cases increases.

3.2. The Number of Daily Flights Compared to the Same Period in 2019

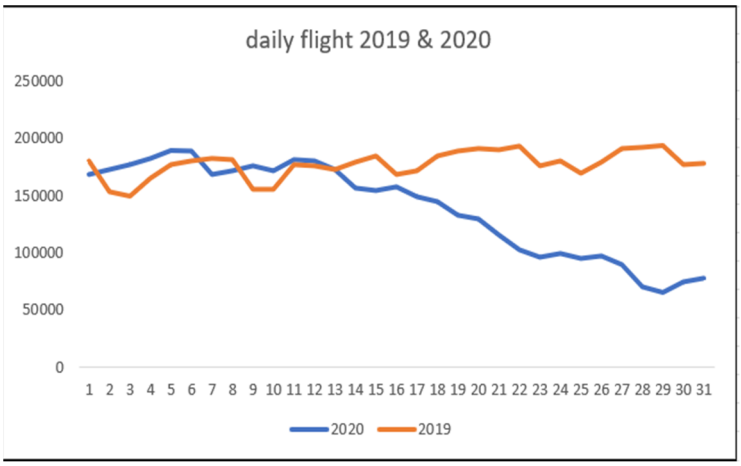

Figure 2. Comparison diagram of the number of daily flights in March 2020 compared with the same period in 2019

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To better understand the impact of the epidemic on the number of daily flights. This report compares the number of daily flights in March 2020 with the number of daily flights in the same period in 2019, and draws a comparison diagram of two sets of data. The report also charts the trend over two years for differences (The number of daily flights in 2019 minus the number in 2020) in the number of daily flights over the same period.

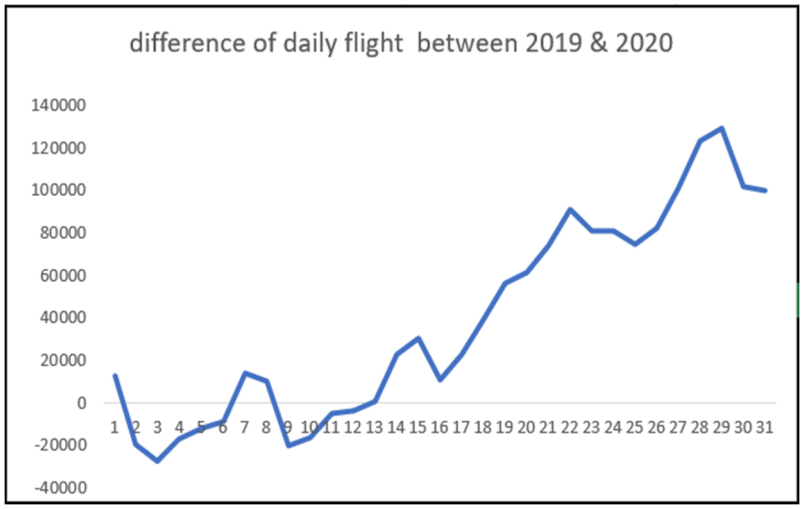

Figure 3. Tendency chart of two years for differences in the number of daily flights over the same period

According to Figure 2, it can be observed that between March 1 and March 13, the number of daily flights in 2019 and 2020 is very similar. But after March 14, the number of daily flights in 2020 plummeted, having a growing gap between the curve for the same period in 2019.

At the same time, the difference between the same period as shown in Figure 2 starts to rise sharply after March 14. That is, from March 14, 2020, the number of daily flights in 2019 is more and more than that of the same period in 2020. This is consistent with the timing of the sudden increase in the number of new confirmed cases worldwide since 14 March in Figure 1. This information also partly reflects the fact that the increase in the number of new confirmed cases will lead to a reduction in the number of daily flights.

3.3. Regression Analysis

To better understand the impact of COVID-19 on the air transport industry. In this report, the number of new confirmed cases per day was used as the explanatory variable, and the number of daily flights was used as the response variable to draw a scatter plot.

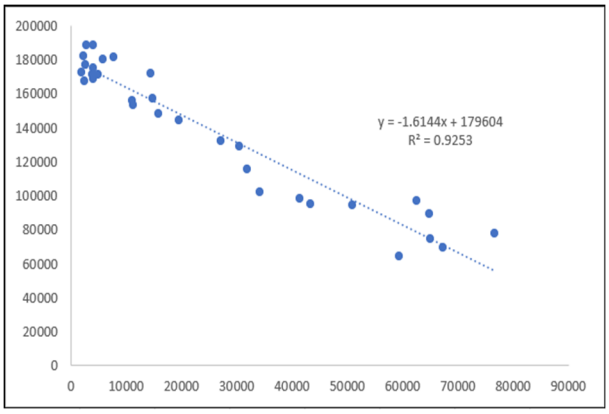

Figure 4. Scatter plot of two indicators

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The scatter plot shows that the number of new confirmed cases per day and the number of daily flights is approximately negatively correlated linearly. Therefore, they can be fitted by linear regression. Without obvious outliners, the calculated correlation between the number of new confirmed cases and daily flights was approximately 0.96193. As the absolute value of the correlation is closer to 1, the correlation between the two is stronger, so there is a strong negative correlation between COVID-19 and the air transport industry. In addition, using regression model, their linear regression equation is: Y=-1.6144x+179604.

After calculating the value of F, F=359.2006. Therefore, the model has a high degree of goodness of fit. That is, when the number of new confirmed cases is increased by 1,000, the number of flights per day is reduced by about 1,614.

According to regression analysis, there is a negative correlation between COVID-19 and the air transport industry. This negative correlation is partly due to some government policies. Due to the inactive attitude of the governments led by the United States to the COVID-19, the situation deteriorated rapidly. This has led to an increase in the negative impact of the COVID-19 on all walks of life in the world. At the same time, due to the rapid deterioration of COVID-19, governments around the world have issued travel ban, which has led to an overall drop in the number of flights around the world, the number of flights cancelled at least 80% (Air transport world, 2020). To some extent, this shows that the COVID-19 is hindering the development of the air transport industry.

3.4. Limitation of the Indictors and Analysis

There are so many flights around the world, so fewer comprehensive data may lead to errors. But because the base of the number of global flights is so large that errors can be ignored, the study remains valid. In addition, the report ignores the impact of potential variables on the air transport industry, such as climate, household income, etc. But because the impact of potential variables is far smaller than that of the epidemic, the conclusions remain credible.

4. Conclusion

In conclusion, the report found that the COVID-19 had a negative impact on the air transport industry, with a significant negative correlation. Firstly, this report compares the trend of the number of new confirmed cases per day and the number of daily flights to find a certain correlation between them. Then, the report compares the number of daily flights in 2019 with that of the corresponding period in 2020 and looks at the trend of the difference over the same period to arrive at the preliminary conclusion that an increase in the number of new confirmed cases will lead to a decrease in the number of daily flights. Finally, the two indicators were plotted as scatter plots and the correlation between them was calculated to draw the conclusion that there is a significant negative correlation between COVID-19 and the air transport industry.

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