Empirical Analysis of Covid-19 Epidemic on Transportation Industry

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Keywords: Big data analysis, COVID-19, Financial, Transportation industry

Abstract: At the end of 2019, the outbreak of the COVID-19 attracted global attention. The global spread of the epidemic threatens people's lives and impacts all walks of life around the world, such as the transportation industry. This report aims to verify the effect of the new epidemic on the sector's development and takes the passenger transport industry, which includes rail, road, air and water transport, as an example. The relationship between the passenger volume and the number of confirmed cases will be analyzed through reliable data collection, and the relationship between the epidemic situation and the passenger transport industry will be explained by regression analysis.

1. Introduction

In 2020, the novel coronavirus pneumonia outbreak, In the early stage of the epidemic, the cases increased rapidly, threatening the safety of people's lives. One view is that the global spread of covid-19 threatens people's lives and impacts all walks of life in the world. The spread of the epidemic worldwide will have a systemic effect on the relevant global industry chain and supply chain (Li, 2020). This report aims to verify the impact of the new epidemic on the development of the industry and takes the passenger transport industry, which includes rail, road, air and water transport, as an example. The relationship between the passenger volume and the number of confirmed cases will be analyzed through reliable data collection, and the relationship between the epidemic situation and the passenger transport industry will be explained by regression analysis.

2. Qualitative interpretation and Indicators

According to Zhou Jian's research, the novel coronavirus pneumonia, which began to erupt at the end of 2019, has caused a significant blow to the transportation industry. Wu Yejun pointed out that the epidemic harms the transportation industry, especially on the passenger transport industry in the short term. Generally speaking, the epidemic's severity is negatively correlated with the passenger volume. The more serious the epidemic situation is, the smaller the passenger traffic volume is. However, no matter how long the epidemic lasts, it will not fundamentally affect the long-term growth trend of China's transportation industry (Zhou and Jiang, 2020).

In this report, the number of confirmed cases and deaths in the current month can reflect the extent of the epidemic. According to Huang Ping's paper, statistics of passenger traffic volume are the basis for forecasting transportation, passenger transport development, and passenger transport management. It is also helpful to predict the future development trend of regional passenger transport. Besides, year-on-year growth generally refers to the growth rate compared with last year's same period. The year-on-year growth can directly reflect the epidemic's impact on passenger traffic volume because it compares this year's data with the same period last year. Therefore, the year-on-year growth of passenger traffic volume can directly reflect the degree of passenger traffic affected. This report will comprehensively consider the number of confirmed cases per month, the number of monthly deaths, the present value of passenger traffic volume, and the year-on-year growth of passenger traffic volume to illustrate the epidemic's impact on the development of the passenger transport industry.

3. Data sources and Treatment

All reliable data are from the National Bureau of Statistics (2020) and the China National Health Commission (2020). The data from January to August in 2020 are selected. To ensure time consistency, all indicators are in the month's unit. Among them, the data unit related to passenger traffic volume is 10000 people, and the data unit connected with the epidemic situation is one person. This report calculates the number of confirmed cases and the number of deaths per month based on daily new cases and death cases. The formula of year-on-year growth rate = (amount of current period - the amount of the same period) / amount of the same period * 100% is used to calculate the year-on-year increase of passenger flow. Finally, this report uses five number analyses to process the monthly data.

4. Empirical analysis

4.1. Data analysis

Table.1. average, maximum, decimal and standard deviation of four data.

Month	Number of confirmed cases	Number of death	Passenger volume in the same period of 2019	Passenger volume in the same period of 2020	Year on year growth in passenger traffic
1	259	11821	127415	141698	-10.1
2	2614	68147	18645	158843	-88.3
3	442	2651	38573	143032	-73
4	1328	1766	57320	143977	-60.2
5	2	205	73748	145481	-49.3
6	3	642	80051	142289	-43.7
7	20	2890	89292	153968	-42
8	62	2280	98214	157821	-37.8

From table 1, it is evident that the number of deaths and infections in February was the largest, 2614 and 68147 respectively. In terms of the number of deaths and patients, February was the most severe time of the epidemic. At the same time, the corresponding current passenger flow in February was 186.45 million, with a year-on-year increase of - 88.3%, which is the most significant decrease. Because China's economy is developing in the absence of an epidemic situation, the situation of the passenger transport industry should be better than last year, and the year-on-year growth should be positive. By calculating the year-on-year growth, it is clear that since the outbreak of the epidemic, the monthly passenger flow has shown a downward trend compared with that of last year. Due to insufficient attention paid to the epidemic situation in January, the passenger flow in January decreased the least, 10.1%, compared with January 2019. With time, the epidemic situation gradually improved, and the passenger flow was also increasing. Although the year-on-year growth was still negative, the absolute value of the year-on-year growth gradually decreased from February. In conclusion, the year-on-year growth shows that the epidemic has indeed caused a blow to the passenger transport industry and reflects the epidemic's impact on passenger traffic volume.

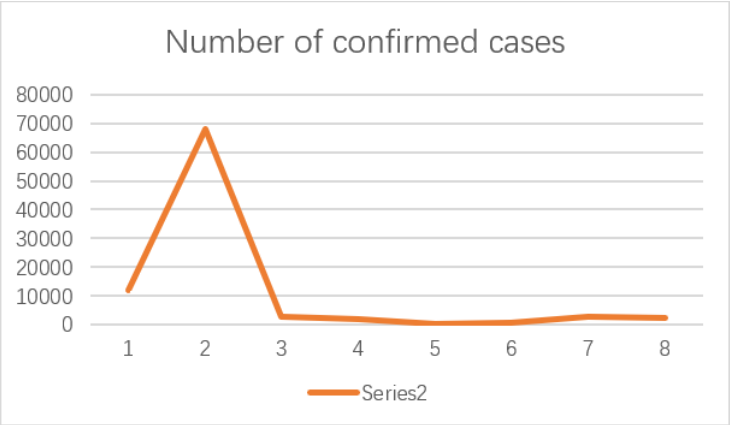

Figure 1. broken line chart of existing cases

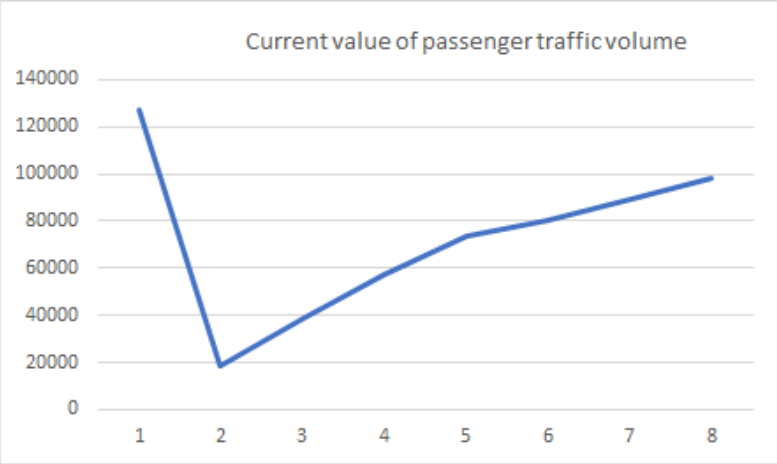

Figure 2. broken line chart of current passenger volume

Based on the number of confirmed cases per month, it is evident from Figure 1 that the epidemic situation has become severe from January to February, and the epidemic situation has improved since February. Although the number of confirmed cases increased from June to August, the overall condition of the epidemic situation is better than that of February. Figure 2 shows the change in monthly passenger flow. In line with the epidemic situation shown in Figure 1, the passenger flow reached the lowest value in February and increased from February to May. Although the repeated epidemic situation in June, the passenger transport industry gradually recovered because of the timely national control and the passenger flow still increased. However, from June, the growth of passenger flow became slow. At the same time, the year-on-year growth of passenger flow reached the lowest value in February, and the development of passenger flow slowed down after May, which is consistent with the above analysis.

4.2. Regression analysis

This report takes the number of confirmed cases per month as the explanatory variable, passenger flow as the response variable and randomly selects the 17-day data from the beginning of February to the beginning of March to make a linear regression analysis. The judgment coefficient is 0.8673, which indicates that the degree of the fitting is high and the correlation between variables is strong. The linear regression equation of passenger volume and the monthly confirmed number is as follows:

$$y = -0.2746x + 1635.2$$

This shows a negative correlation between the severity of the epidemic and the passenger volume. The more deaths or confirmed cases in the month, the more serious the epidemic situation, the less passenger traffic volume. Moreover, the passenger flow will drop by 27.46 million for each additional case.

5. Error analysis

This report may be limited to the use of the number of confirmed cases to measure the epidemic situation because the number of confirmed cases reflects the number of people who got sick on that day (that month), and the COVID-19 has an incubation period. In addition, the report ignores the possibility of potential variables, such as national policy, in regression analysis. However, since the impact of possible variables was much less than the epidemic's impacts in February, the conclusion is still credible.

6. Conclusion

This report draws several conclusions on the epidemic's impact on the passenger transport industry. First of all, from January to February, the epidemic situation worsened and passenger traffic volume decreased significantly. However, with the improvement of the epidemic situation, passenger traffic volume gradually increased. Although the passenger volume continued to pick up, the recovery speed was reduced because of the slight deterioration of the epidemic situation in June. Besides, the year-on-year growth of passenger traffic is negative, which reflects that the passenger transport industry is indeed affected by the epidemic. In summary, the epidemic's severity is negatively correlated with the passenger volume. Finally, regression analysis showed that the epidemic situation was closely related to passenger traffic volume. Overall, the epidemic has hit the passenger transport industry and hindered the development of the passenger transport industry. However, with the improvement of the epidemic situation, the passenger traffic volume is gradually rising, and the passenger transport industry will slowly return to normal development.

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