Weather Impact of Uber Pickups in NYC

Analysis and Conclusion

Project 1, Group 9

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This project investigated how weather factors, including temperature, visibility, and precipitation, influence the demand for Uber services. We addressed the temporal aspects, examining how Uber pickups fluctuate over time, hourly, daily, or monthly. The geospatial analysis shed light on the distribution of Uber pickups across various city boroughs.

Questions for the Analysis

1. How do pickup patterns change throughout the day?
2. Which borough has the highest and lowest pickup rates?
3. Are there any significant differences in pickups on holidays compared to regular days?
4. How would you estimate the impact the weather has on Uber pickups?
    a. Do certain weather conditions lead to an increase or decrease in pickups?
    b. Are there any correlations between weather variables and pickups?

Analysis

Question 1 Analysis

We observed that the highest demand areas are consistently Manhattan, Brooklyn, and Queens. Furthermore, the timing of requests varies depending on the day and the borough.

On typical days in Manhattan, we see a peak in requests during commuting hours, which reflects the borough's bustling workday routine. In contrast, Brooklyn and Queens experience their peak demand on normal days during the evening, from when people return from work until midnight.

Holidays exhibit a unique demand pattern, with all boroughs experiencing their highest number of requests at midnight. This suggests that people tend to utilize Uber services more during late-night hours when they are not constrained by work schedules.

Weather also plays a significant role in demand fluctuations. In January, demand is lowest, possibly due to people being out of the city for vacations. Conversely, February sees a notable increase in demand, likely because of the colder weather. As the weather warms up in May and June, requests peak, highlighting the influence of climate on demand.

Our focus on Manhattan revealed that February is a particularly interesting month, with consistently high demand from 6 to 8 p.m., both on regular days and holidays. This surge in

demand during February's evening hours surpasses even the peak months of May and June on holidays.

Question 2 Analysis

We compared the pickup rate per day and per capita for each borough and also considered the population (researched online from Google) for each borough.

Manhattan has the greatest pickups, 72.7% out of the total pickups for New York City, and has the highest pickup rate, 23.87%, but the population for Manhattan is the 4th among the 6 boroughs.

EWR has the greatest population but has almost 0% out of the total pickups for New York City and has the lowest pickup rate of 0.02417%

There is nearly no difference in the daily pickup rate for holidays and regular days. However, regular days' pickup rate per capita is higher than holidays.

In conclusion, There is no direct relationship between population and pickup rates.

Question 3 Analysis

According to the P-value analysis using an alpha limit of 0.05, there is a significant difference between the number of holiday pickups and regular days. This result could be due to the number of holidays in the calendar during the first semester of 2015. We counted 58 holidays, including weekends, in six months. However, the analysis of average pickups on holidays and regular days during the six months is quite similar, as shown on the graph "Monthly pickups count over 6 months." Both increase as time passes, with a slight decrease between March and April, possibly due to the spring break vacations. However, the number of pickups increased as the weather became warmer.

A more focused analysis through the daily pickup change reinforces the idea of similar patterns. However, it took our attention one peak on the third weekend of May, followed by a high decrement of pickups next weekend. This behavior may be due to the long weekend of Memorial Day. Something similar happened one weekend before the 4th of July, which is an essential date for the USA.

Regarding geospatial analysis, we calculate the percentage of pickups in each borough during the six months. Manhattan is the borough with the most activity, taking 72.71% of the total pickups in NYC. In the focused analysis by borough, pickups on EWR are predominant on weekdays. This behavior means that airport pickup is more likely on weekdays. The other boroughs are between ~34% on holidays and ~65% on weekdays.

Finally, we can see a predominant pickup rate on holiday late hours using the heatmap visualization. Meanwhile, some boroughs have a nonhomogenous weekday distribution between peak and late hours.

Question 4 Analysis

We created a correlation matrix for all the data, focusing on Manhattan. The heatmap indicates a mild correlation between pickups and weather conditions. We discovered a strong positive correlation between pickups and warmer weather when examining monthly patterns. In simple terms, as the temperature rises, pickup numbers increase. Notably, February, the coldest month, exhibits an inverse correlation with snow depth, meaning deeper snow leads to more pickups. In conclusion, some weather conditions may increase or decrease pickups; however, further analysis is needed with a bigger data set.

Conclusion

Our data analysis reports four key findings:

(1) weather conditions show a mild correlation with pickups, with warmer temperatures positively impacting pickup numbers. However, a more extensive dataset is necessary to comprehensively understand weather's role in influencing pickups.

(2) Second, our analysis underscores the influence of seasonal and holiday patterns on pickup rates. P-value analysis indicates a notable difference between holiday and regular day pickups, attributed to the number of days differences between regular days and holidays. Peaks observed on Memorial Day and the weekend before the 4th of July further emphasize this trend.

(3) A significant geographic discrepancy exists in pickup rates among New York City boroughs. This result suggests that factors beyond population size are crucial in determining pickup rates.

(4) In addition to our previous findings, our analysis reveals that Manhattan, Brooklyn, and Queens consistently emerge as the highest-demand areas for Uber services. Furthermore, the timing of ride requests varies significantly depending on the day and borough.