Rideshare Companies Uber and Lyft Strongly Affect Taxi and Rental Car Industries

by

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Abstract

The rideshare industry has boomed in recent years, and companies such as Uber and Lyft have disrupted both taxicab businesses and rental car companies. This study analyzes the effect of Uber and Lyft on the taxi industry and the rental car industry. The independent variables are Uber and Lyft rides per day in New York City. The dependent variables are NYC taxicab medallion prices, Hertz stock prices, and Avis stock prices. The conclusions in this study are that Uber and Lyft have caused the decrease in the value of NYC taxicab medallions, the decrease in the value of Hertz stock, and the decrease in the value of Avis stock.

Keywords: Uber, Lyft, Medallions, Hertz, Avis

Introduction

Uber Technologies Inc. (Uber) is a company that provides mobile device software to allow users to hire car transportation with any smartphone. Uber started in 2009 and the mobile application launched officially in San Francisco in 2011; Uber is the biggest ridesharing company in the market, and the company is in 720 cities worldwide (Uber Cities). Uber has an estimated 40 million users, and the company's net revenue in 2016 was $6.5 Billion (Smith 2017). Uber is currently valued at more than $60 Billion by investors (Yerack 2017).

Lyft is a company that offers transportation services similar to Uber, but Lyft has not yet achieved the same amount of market share. Lyft operates in approximately 300 U.S. cities (Hawkins 2017), has 4.8 million active users (Smith 2017), and is currently valued at $7.5 Billion (Yerack 2017).

Ridesharing companies such as Uber and Lyft have disrupted the taxi and car rental industries and substantially hurt the profits of existing companies. The industry changes have not been graceful as local taxi companies have fought rideshare companies politically and legally. In fact, there have even been several reports of Uber drivers in Mexico being assaulted (Associated Press 2017).

Many business commentators simply state that rideshare companies are negatively impacting the taxi and rental car industry,

but rigorous analysis of the link between rideshare company success and taxi and rental car industry challenges is less common. Furthermore, analysis to establish actual causation is rarely provided by business pundits. As such, it is timely for a study that tests the statistical significance of the relationship between the success of rideshare companies and the success of the taxi and rental car industries.

Literature Review

While the stunning success of rideshare companies is a new occurrence, there has been plenty of commentary on how Uber and Lyft are affecting business and personal travel, transportation industries, and the overall economy. For research relevant to this article, this Literature Review will focus on the success of rideshare companies, the decrease of value of the taxicab industry, and the decrease of value of the rental car industry. Additionally, there will be analysis on the likelihood of a causative link between increasing value in the rideshare industry and the decreasing value in the taxicab and the rental car industry.

With the prevalence and convenience of smart phone usage, Uber grew very quickly in popularity. In 2016, Ron Lieber writing in the New York Times explained common frustrations with renting a car that can be alleviated with a rideshare service. Wolf Richter believes that

the popularity of ridesharing companies will continue, and he conducted research on the use of these companies for business travel; he writes, “The collapse of business travel spending on taxis and rental cars is just stunning. And there is no turning back.” (Richter 2017).

One direct victim of the success of rideshare companies is the taxicab industry. The local taxicab industries in most American cities are generally structured as monopolies, and there are laws and local regulations that keep the monopoly in place. Dan Hill of Newsweek describes Uber’s entry into the market as a “shock-and-awe campaign” (Hill 2017). Hill explains that Uber pushed “the envelope with municipal and state regulators, in many places operating in gray areas or, even in some instances, blatantly disregarding local laws” (Hill 2017).

The popularity of Uber and the value of the service that Uber provides has made it impossible for competitors to stop its growth, so profits in the taxicab industry have decreased. In New York City, taxicab medallions are used to enforce the local monopoly and control the supply of taxis. Theresa Agovino writes for Moneywatch and explains that “Just four years ago, the cost to purchase a New York City taxi medallion, an essential license needed to operate a yellow cab, hit $1.3 million . . . . The price of a taxi medallion crashed to its lowest level in about a decade when one sold for $241,000 in March.” (Agovino 2017). Becky Yerack of the Chicago Tribune researched a

similar story in Chicago in 2017 and found that taxi medallions are “worth about one-sixth of what they were four years ago . . . .” (Yerack 2017).

The taxicab industry is not the only victim of the success of rideshare services. Rental car companies have also suffered decreases in value. This may be in part due to a decrease in personal usage, but most of the literature cites significant and quantifiable decreases in business usage of rental cars in favor of ridesharing services. Wolf Richter of Wolf Street explains that in the first quarter of 2017, Uber accounted for 7% of the total business expenses, edging out Starbucks and Delta Airlines, both at 4%. In the second quarter of 2017, the expense percentage for Uber had increased to 9%. (Richter 2017). Shelly Hagan of Bloomberg news provides further support for the prevalence of business usage by reporting that Uber as a business expense increased in 2016, “while use of rental cars and other traditional ground transportation options declined . . . .” (Hagan 2017).

Researchers not only say that the value of rideshare companies is inversely related to the value of the taxicab and rental care industries, but also point to rideshare companies as the causative factor. Becky Yerack of the Chicago Tribune goes so far as to name Uber as the cause of the decrease in the taxicab industry. “Disruption in the industry, in the form of increased competition from Uber and

other ride-sharing companies, has caused medallion values to plunge." (Yerack 2017). Wolf Richter makes a similar argument, writing that the popularity of rideshare companies is a, ". . . structural shift. And it will get bigger. Rideshare companies are not only hammering taxi enterprises, they're also hammering rental car companies in that segment of their business." (Richter 2017)

Theresa Agovino of Moneywatch explains that in San Francisco, the city where Uber made its official launch, ". . . Yellow Cab Cooperative, filed for bankruptcy, citing ride-hailing companies as a contributing factor to its financial woes . . . ." (Agovino 2017). Similarly, Polly Mosendz and Shahien Nasiripour of Bloomberg report that "The distressed taxi industry is under assault from ride-sharing service Uber Technologies Inc. and competitor Lyft Inc." (Mosendz and Nasiripour 2017).

Methodology and Design

In this research, the two independent variables are Uber trips per day in New York City and Lyft trips per day in New York City. The three dependent variables are transfer price of New York City taxicab medallions, stock price of Hertz Global Holdings Inc., and stock price of Avis Budget Group Inc. Hypothesis testing is used to determine if any combination of the independent variables have statistically significant correlation with the dependent variables. The variables are

summarized in Table 1. The measurement time period of analysis is from April 2015 to May 2017.

The null hypothesis in each test is that there is no correlation between the independent variable(s) and the dependent variable, and the alternative hypothesis is that there is a statistically significant correlation between the independent variable(s) and the dependent variable. The test variable is the p-value for Pearson Correlation, and the significance level is 1%.

The independent variables used in this research are number of Uber trips per day in New York City and number of Lyft trips per day in New York City. Uber and Lyft trips are in direct competition with taxi rides, so using these data as independent variables is very reasonable. Additionally, the primary business model of both Hertz and Avis involves renting cars for personal and business use. Uber and Lyft are of course direct substitutes for both of these uses; therefore, it is likely that as demand for Uber and Lyft increases, demand for Hertz and Avis will decrease. In efficient markets, the decrease in demand should be reflected in the stock price of Hertz and Avis. Additionally, the independent variables are direct indications of the prevalence and usage of each company in New York City. The entirety of the services offered by Uber and Lyft is their ridesharing service, so the number of

rides taken per day is an exact indicator of company activity in New York City, which is one of the largest markets in the world.

The independent variable data of rides per day was collected by Todd W. Schneider and based on New York City Taxi and Limousine Commission (TLC) Summary data. The website toddwschneider.com contains this data up to April 29th, 2017. The rides per day for each company was reflected weekly over the time period.

NYC taxicab medallion price is an appropriate dependent variable because medallions are required for taxis to operate, and ownership of one gives drivers the rights to a limited market. Mosendz and Nasiripour (2017) explain, “Medallions, the small metal shields affixed to the hoods of taxi cabs, are issued by the local taxi authority and effectively allow the cabs to operate legally.” As such, the transfer price of medallions is a strong indication of the profitability of the taxi industry. Taxicab medallion transfer prices are available from the NYC Taxi and Limousine Commission. The transfer prices of medallions are listed for each month over the time period. For purposes of this research, it is assumed that each medallion sale took place on the 15th of the month in which it occurred.

The stock prices of two major car rental companies, Hertz and Avis, are appropriate dependent variables because stock price serves as an appropriate reflection of company value. Hertz trades on the

NYSE, and Avis trades on the NASDAQ. Both of these stock exchanges are of course highly liquid, efficient markets and are reflective of real time investor estimation of industry and company value. The stock price of Hertz (HTZ) and Avis (CAR) is taken from scottrade.com. In cases where the stock price of each company did not align with the exact date of rides per day, the stock price from one or two days before or after was used as a proxy.

Results

The full test results are indicated in Table 2, Table 3, and Table 4. Key insights are that both Uber and Lyft Rides per day were shown to have significant explanatory value in all three dependent variables. In fact, the independent variables alone or combined were found to be statistically significant in every single scenario. There are substantial differences among the percent of variation explained and the strength of the significance in each of the three dependent variables. Those differences will be discussed further, and are likely due to difference in size between Uber and Lyft, the unique nature of the NYC taxicab industry, and the differences between Hertz and Avis in size.

NYC Taxicab Medallions as a Dependent Variable (Table 2)

When examining NYC taxicab medallions as a dependent variable, the data indicate that both Uber and Lyft rides per day have strong, statistically significant correlation with medallion value.

However, the R-Square and Adjusted R-Square values only range from 25.22% to 27.93%. So Uber and Lyft rides per day are significant and arguably causative factors in the price of NYC medallions, but clearly there are other factors affecting close to 75% of the variation.

A likely conclusion is that the ridesharing industry has significant and measurable negative impact on NYC medallion prices, and the ridesharing industry can be cited as a reason for the sharp decline in medallion value. However, the actual transfer price of any one medallion will fluctuate significantly based on unique factors. There are many variables that could affect the transfer price of taxi medallions in NYC, and the information provided by the TLC is limited. In some instances, the TLC lists items in the Notes section of the assets sales such as *Partnership, Foreclosure, Divorce Settlement,* and *Estate*. Some of these prices are drastically different than the averages for that time period, but no further explanation besides one or two words in the Notes is given. So the unique factors of any one transfer are not known, and the unique factors may have a large effect.

Hertz Stock Price as a Dependent Variable (Table 3)

When Hertz stock price was tested as the dependent variable, the independent variables had the highest R-Squared values and the most significant F Statistics. Uber Rides per Day alone had an astoundingly high R-Square of 84.02%, and Lyft alone had an R-Square

of 79.26%. When both Uber and Lyft were used as independent variables to predict Hertz price, the Adjusted R-Square was only marginally higher than the Adjusted R-Square for Uber alone.

These data could be used to support the conclusion that Uber is the causative factor in determining most of the price of Hertz stock. The data indicate that Uber rather than Lyft is the better explanatory variable for Hertz stock price. Uber is much larger than Lyft in revenue, valuation, number of drivers, and rides per day. The success of Uber is therefore more likely to affect the stock price of Hertz, and the data would support this conclusion.

The evidence for ruling out Lyft as the causative factor in the price of Hertz is as follows. While Lyft in and of itself has strong explanatory value, when Lyft is combined with Uber in the model, the result is only a slight increase in R-Square and Adjusted R-Square values. Therefore, the explanatory value of Lyft could be entirely due to the strong correlation between Uber and Lyft, and this problem is of course known as multicollinearity. See Table 5 for the correlation results between Uber and Lyft. In fact, when Uber rides per day are regressed against Lyft rides per day, the Correlation Coefficient is .95, the R-Square is .897, the Adjusted R-Square is .896, and F Test Significance is 3.9 x 10-55. These numbers indicate an extremely strong correlation and an extremely high likelihood of significance. As

such, it is likely that the explanatory value offered by Lyft is almost entirely due to its correlation with Uber.

Avis Stock Price as a Dependent Variable (Table 4)

When Avis stock price is tested as the dependent variable, both Uber and Lyft rides per day have significant explanatory value; however, the R-Square and Adjusted R-Square values are significantly lower compared to when Hertz is tested as the dependent variable. The Adjusted R-Square is 30.28% for Uber and 32.82% for Lyft. In the case of Avis, it seems that Lyft provides more explanatory value; in fact, when Uber is added to Lyft as an independent variable, the Adjusted R-Square actually decreases to 32.26%.

It is difficult to say exactly why Lyft is a better indicator than Uber in this case. It may be due to the fact that Avis is a much larger company than Hertz; Avis has a market capitalization of $2.67 Billion, and Hertz has a market capitalization of $1.21 Billion (Scottrade). As such, Avis could be less sensitive to changes in the markets that Uber is currently dominating and more sensitive to other macro-economic factors. Those macro-economic factors might be more likely reflected in the success of Lyft rather than Uber. Lyft, as a less-dominate player in the market is more subject to fluctuations in the economy.

Conclusion

In the analysis of NYC Taxicab Medallions as the dependent variable, the data show a significant negative relationship between the number of Uber and Lyft trips per day and the transfer price of medallions. The number of Uber and Lyft rides per day is in direct competition to the taxi industry. Additionally, car rides offered are the sole service offered by both taxis and rideshare companies; therefore, the independent variables are very likely to be the causative factors in the changes of the dependent variable. Furthermore, the Literature Review provides evidence that Uber and Lyft have caused the decrease in value in the taxi industry. As such, this research provides very strong evidence that rideshare companies have caused the decrease in NYC Taxicab Medallions.

The other interesting conclusion is that while rideshare companies have a significant negative impact on medallion prices, that impact only explains roughly 25% of the variation in prices. This just illustrates the unique nature of individual medallion transfers and does not detract from the strength of the correlation.

In the analysis of Hertz stock price as the dependent variable, the data also illustrate a strong negative relationship between rideshare company success and Hertz company value. The case for proving causation is similar to the logic used in the taxi industry. The services offered by rideshare companies are in direct competition with

the rental car industry; additionally, the entirety of services offered by both industries can be quantified by number of rides. As such, it is very likely that an increase in the number of rides given by rideshare companies would cause a decrease in value in the rental car industry. Furthermore, the Literature Review supports the conclusion that rideshare success is a causative factor in the decline of Hertz stock.

Not only is there strong evidence of the success of rideshare companies as the cause of the decline of Hertz stock, the success of Uber specifically explains almost 80% of the variation. The services provided by Hertz and Uber are very closely related, and there are not many unique factors that account for the value of Hertz stock other than the company's success in delivering its core service. The data also show that the variation in Hertz stock is best explained by Uber rides per day rather than by Lyft rides per day. The size of Uber gives it a larger effect on Hertz value. Additionally, the correlation between Hertz and Lyft is likely largely due to a multicollinearity issue, with Uber and Lyft be highly correlated.

In the analysis of Avis as a dependent variable, the success of rideshare companies was shown to be a highly correlated independent variable. Just as with Hertz and NYC Medallions, a strong argument can be made that rideshare company success causes a decline in value in Avis stock. Again, the entirety of business operations in Uber, Lyft, and

Avis can be highly quantified with number of rides. Furthermore, rideshare companies are in direct competition with Avis. Lastly, the Literature Review also supports naming rideshare success as a causative factor in the decline of Avis.

The additional interesting insights with Avis are that only roughly 30% of the variation in stock price is explained by the independent variables and that Lyft explains more of the variation than Uber or Uber and Lyft combined. The data indicate a strong negative correlation that is highly likely to be a causative factor; however, the total fluctuation in Avis stock value is less explained by rideshare company success and more explained by other factors. Furthermore, the other factors that explain the variation in Avis stock are more accurately reflected in Lyft rides per day than Uber rides per day. This is likely because the other factors that explain 70% of the variation in Avis stock price are macro-economic factors that are better reflected in the success of Lyft; Lyft is the less dominate player in the rideshare market, so Lyft is more subject to shifts in the overall economy.

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Table 1

Dependent and Independent Variables

Dependent Variables	Independent Variables
Transfer Price of NYC Taxicab Medallions	Uber Trips Per Day in NYC
Stock Price of Hertz Global Holdings Inc.	Lyft Trips Per Day in NYC
Stock Price of Avis Budget Group Inc.	

Table 2

NYC Medallions as Dependent Variable

Independent Variable	R-Square	Adj. R Square	Hypothesis Test Decision	Sig F
Uber Rides/Day	27.05%	25.43%	Reject H_o, Accept H_a	0.0001789
Lyft Rides/Day	26.84%	25.22%	Reject H_o, Accept H_a	0.0001913
Uber+Lyft Rides/Day	27.93%	24.66%	Reject H_o, Accept H_a	0.0007413

Table 3

Hertz Stock Price as Dependent Variable

Independent Variable	R-Square	Adj. R Square	Hypothesis Test Decision	Sig F
Uber Rides/Day	79.26%	79.07%	Reject H_o, Accept H_a	1.1058E-38
Lyft Rides/Day	78.03%	77.83%	Reject H_o, Accept H_a	2.4615E-37
Uber+Lyft Rides/Day	80.83%	80.47%	Reject H_o, Accept H_a	4.2164E-39

Table 4

Avis Stock Price as Dependent Variable

Independent Variable	R-Square	Adj. R Square	Hypothesis Test Decision	Sig F
Uber Rides/Day	30.92%	30.28%	Reject H_o, Accept H_a	2.84646E-10
Lyft Rides/Day	33.43%	32.82%	Reject H_o, Accept H_a	3.72443E-11
Uber+Lyft Rides/Day	33.50%	32.26%	Reject H_o, Accept H_a	3.31493E-10

Table 5

Correlation Between Uber Rides per Day in NYC and Lyft Rides per Day in NYC

Correlation Coefficient	R-Square	Adj. R Square	Hypothesis Test Decision	Sig F
0.9471	89.70%	89.61%	Reject $H_{o,}$ Accept H_a	3.94749E-55