

## Rent Price Dynamics of Airbnb in New York

Yongqi Li<sup>\*,1</sup>, Silei Xie<sup>2</sup>

<sup>1</sup>International College, Jiangxi University of Finance and Economics, Nanchang, China

<sup>2</sup>Financial College, Jiangxi University of Finance and Economics, Nanchang, China

\*corresponding author

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**Abstract:** Rent price of Airbnb's in New York is high, due to low vacancy rate of rooms, large number of tourists, and high income per person. We analyzed the significance between the Airbnb rent price in New York and low vacancy rate of rooms, large number of tourists, and high income per person, and expected rental price to establish a relationship between these three factors. For the vacancy rate, we gathered information from Mashvisor which analyzed the monthly vacancy rate per household in downtown Manhattan since this category looks mainly based on the Airbnb's official website data. Exploring this relationship revealed higher correlation between higher Airbnb rent price and lower vacancy rate. The second part researched cities with higher tourism may have different impact on rental price from those with lower tourism. This section focuses on whether cities with a large number of visitors may result in higher rental prices compared to cities with fewer visitors. The data was collected from government documents in official websites. We found that the Airbnb rental price did not rise greatly due to larger number of tourists. The third part explored the income per person of New York every year, to find out whether the different groups may have any different impact on the Airbnb rental price. We collected data from NYC database. It was discovered that the group with high income per person impacts different rent price of Airbnb in New York compared to the group with low income per person.

### 1. Introduction

According to NYC government official website, New York, with a population of 8,550,405 in the 2015 census, is the most populous city in the United States. It also has the highest population density of any major city in the United States, with over 27,000 people per square mile. Approximately two-thirds of dwelling units in New York are renter-occupied, which is over twice the national average. Moreover, New York is the third largest market for Airbnb in the world and also one of the earliest places where the Airbnb website was used. Therefore, we intend to use the rent price of Airbnb in New York to analyze its pricing methods from three aspects; low vacancy rate of rooms, large number of tourists, and high Income per person. By finding out the factors for the high rental prices in New York, we can make inferences on the pricing problems in New York and other similar cities faced by the emerging short-term rental companies and communities. At the same time, it also provides guidance for the development of housing short-term sharing economy.

### 2. Literature Review

#### 2.1 Low Vacancy Rate

Although the relationship between rent price of Airbnb and vacancy rate of rooms have not been extremely researched yet, the impact of vacancy rate of houses on rent prices has been extensively studied and researchers have found that higher vacancy rate of houses leads to lower housing rent price.

The origins of New York's landlord-tenant tensions go much further back, to the years after World War I, when a severe housing shortage encouraged landlords to raise rent prices to high levels, prompting the Republican state legislature to impose rent controls for the first time. By April 1920,

New York's traditional housing shortage had reasserted itself. The vacancy rate was less than one-third of 1%. Rent prices began increasing by as much as 140% in a year, or 15 times the cost of food. The one thing many parties agreed on was that rising rent prices was the product of the housing shortage [1].

The statistics show that rent prices all over midtown Manhattan paint a picture of flat, even falling prices. At the end of 2004, the average asking rent in the high-end midtown plaza district was \$71.80 per square foot. At the end of this year's first quarter, the asking price was \$69.25, according to real estate tracker CoStar Group Inc. With supply and demand still rising, those numbers might be misleading. Midtown rents for Class A space have risen by as much as 15% in the last six months alone, reports Ken Krasnow, director of tristate brokerage at Trammell Crow Company [2].

## **2.2 Large Number of Tourists**

The impact of tourists on rent price has been studied and researchers have found that increasing tourists results in higher rent price. Combining an increase in the level of seasonality with a large increase in the number of arrivals may intensify the pressure to raise rent prices [3]. The number of tourists influences land prices[4], and land prices is positively related to rent price [5]. Therefore, the number of tourists may be positively related to rent price.

Land price is positively related to rent price according to recently developed panel cointegration methods that permit structural breaks [5]. There are two main reasons why the number of tourists influence land prices. And indirect influence is that since the middle of 1980s, increasing number of tourists, has increased the rate of demand for goods and services. This issue caused promotion of commercial-services activities in the city and consequently the price of land and trade units especially across main streets of the city severely have increased. A direct relation is that demand of tourists for buying land is added the cost of land in the city. This issue has increased the price of land in some cities to 1000 times and other sections by 60,000 times [4].

## **2.3 High Income Per Person**

The influence of income per person on rent price of houses has been extensively studied and researchers have found that higher personal income leads to higher rent price.

The higher disposable income, the higher the demand for housing and the higher the rent for housing [6]. It was anticipated that income may have a positive effect on rent. The greater the income, the more likely that they have the capacity and desire to buy housing. Not only does this point to a greater demand for buying than for renting, but also indicates a higher potential for future price appreciation [7].

Intermetropolitan variation in housing prices, rent and land prices has been studied and researchers found that the empirical results show that income differences always have the greatest impact on price changes between metropolises [8].

# **3. Methods**

## **3.1 Vacancy Rate**

Data for the variable vacancy rate of room has been collected by mashvisor.com. Mashvisor is a traditional and Airbnb investment property website. Through an online platform that aggregates real estate data, it makes profitable real estate investment and leasing strategy decisions for investors. The platform provides Airbnb's historical rental data and analysis, such as cash flow, cash return, vacancy rate and rental market intensity indicators, to identify the safe investment market potential of traditional and short-term accommodation (Airbnb) properties. Mashvisor data is updated in real time based on the real-time rental price of Airbnb official website, and the statistical caliber of the city's Airbnb rental price is relatively uniform. Therefore, we use the Mashvisor data for comparison.

The existing data is the number of booking times per month and the average rent price per month. The vacancy rate was calculated by using the average monthly rent of more than 100 houses in Manhattan, and the average monthly vacancy rate of these 100 households (*Vacancy Rate* = 1 –

$\frac{\text{the number of bookings}}{\text{the number of days per month}}$ ). And the average rental price is the average price of each month of these houses. These data are analysed through T-test of correlation significance. The expected outcome is that there is a relationship between the vacancy rate and the rental prices in New York. We hypothesize that  $H_0: \rho = 0$  and  $H_1: \rho \neq 0$ .

### 3.2 Tourism

We chose ten metropolises in the world and divided them into two groups with high tourism and low tourism. The number of tourists in each city is collected from the official website of the government or the state and the country. And the short-term rental prices for Airbnb in these cities over the years are calculated by using an independent web crawler technology (tomslee.net, a website that does not belong to Airbnb) based on Airbnb's official website data. These data are analyzed by using the t-test of sample means assuming unequal variance. This paper is expected that the Airbnb rental prices are different between high tourism and low tourism. We hypothesize that  $H_0: \mu_1 = \mu_2$  and  $H_1: \mu_1 \neq \mu_2$ .

### 3.3 Income Per Person

We collected data from NYC Open Data, the New York official government website, for income per person in New York from 2014 to 2017. The short-term rental prices for Airbnb in New York in these years are also calculated by the web crawler technology. And we divided these data into 2 groups, both with 2 samples. This paper is expecting that different income groups impact different rent prices of Airbnb in New York each year. These data are analyzed by using a wilcoxon rank sum test. We hypothesize that  $H_0: \mu_{g1} = \mu_{g2}$  and  $H_1: \mu_{g1} \neq \mu_{g2}$ .

## 4. Findings

First, we examine the relationship between vacancy rate and rent price of Airbnb. We hypothesize that  $H_0: \rho = 0$  and  $H_1: \rho \neq 0$ . The value of  $r$  equals to -0.73. Using a two-tailed t test of correlation significance with 95% confidence and 10 degrees of freedom, we found a calculated value of  $t$  is -3.35. Since the calculated value of  $t$  exceeds the critical value of  $t$  (+/- 2.228), we have to reject the  $H_0$  hypothesis and fail to reject  $H_1$  hypothesis. There is sufficient evidence to suggest that the relationship between vacancy rate and rent price of Airbnb exists in New York.

Second, we examine whether the Airbnb rental prices are different between high tourism and low tourism. We hypothesize that  $H_0: \mu_1 = \mu_2$  and  $H_1: \mu_1 \neq \mu_2$ . Using a two tailed t-test in a sample mean assuming unequal variance, with 95% confidence and 5.86 degrees of freedom, we found a calculated value of  $t$  is 0.093. Since the calculated value of  $t$  does not exceeds the critical value of  $t$  (+/- 2.571), we fail to reject the  $H_0$  hypothesis and have to reject  $H_1$  hypothesis. There is insufficient evidence to suggest that the rental price in cities with high tourism is different from those with low tourism.

Third, we examine whether different income groups impact different rent prices of Airbnb. We hypothesize that  $H_0: \mu_{g1} = \mu_{g2}$  and  $H_1: \mu_{g1} \neq \mu_{g2}$ . Using a wilcoxon rank sum test with 2 samples in each 2 groups, we found the rank sums of 3 and 7. Since the rank sums alpha is 0, we can be 100% confidence that there is a difference in population mean. Therefore, we have to reject  $H_0$  hypothesis and fail to reject  $H_1$  hypothesis. There is sufficient evidence to suggest that the high income group impacts different rent price of Airbnb with low income group.

## 5. Conclusion

The analysis found that the vacancy rate had a greater impact on the rent price of Airbnb. Our research is consistent with other studies about vacancy rate and personal income, but it is inconsistent with others about tourism. As indicated by the findings, we found that the vacancy rate and the personal income of the local residents have a significant impact on the rent price of Airbnb. This means that the sponsorship of the Airbnb listing and the increasing personal income of New York

have raised the rent price of Airbnb in New York.

However, we found that the number of tourists has little effect on the rental price of Airbnb. This result was unexpected. We think there may be two reasons for this. First, in addition to the demand for tourists to rent housing, there is a large number of long-term rents of staff and international students in New York. Compared to the effect of the number of tourists on the rental price, long-term rental may have a more significant impact on its price. Second, some of the houses rented by the Airbnb have no strict requirements on the number of residents. Many tenants may rent a house together to share the rental cost. Therefore, the number of visitors to the number of rented houses will be relatively reduced. The impact of Airbnb's rental prices has thus been weakened.

This article has two limitations. First, the article uses the relationship between the annual vacancy rate in central Manhattan and the rent price of Airbnb to derive the relationship between New York's annual vacancy rate and the rent price of Airbnb. Second, there is hard to collect the average daily rent price of Airbnb in a city with a very small number of tourists. It can only be divided into two categories according to the relative size of the number of tourists in the collected data.

So far, there have been relatively few studies on the factors affecting the price of Airbnb. Based on this paper, future research should focus more on the impact of the intrinsic properties of rental unit, room size, number of rooms, etc. on Airbnb rentals. At the same time, we should increase the research on the impact of local housing prices and local housing rents on Airbnb rent prices.

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