An Analysis of Airbnb Listings in U.S. Cities

& using the Zillow Home Value Index to predict Listing Price

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Introduction

The cities used in the analysis range from large U.S. cities such as New York City and Los Angeles to smaller, but emerging cities such as Portland and Austin.

The listing data from these cities revealed interesting trends pertaining to the supply and demand, price and popularity of Airbnb listings in the U.S.

These trends suggest some recommendations that could be made to improve Airbnb’s marketing and overall strategy.

Population and Popularity:
In which cities are there the most Airbnb listings?

Count of Listings per City

- The normalized listing count tells us the number of listings there would be in each city if they all had the same population.

- The higher this number the more residents are listing their home on Airbnb compared to others.

- We use this as an indicator of the supply of listings in a city.

City	Count of Listings	Population (in millions)	Normalized by Population
New Orleans, LA	4514	1.26	3574.34
Austin, TX	5835	2.00	2916.25
San Diego, CA	6608	3.30	2002.71
New York, NY	39553	20.18	1959.79
Los Angeles-Long Beach-Anaheim, CA	26080	13.34	1955.01
San Francisco, CA	8619	4.66	1851.11
Nashville, TN	3277	1.83	1790.37
Portland, OR	3360	2.39	1406.31
Seattle, WA	3818	3.73	1022.611
Denver, CO	2505	2.81	890.09
Boston, MA	3585	4.77	750.89
Washington, DC	3723	6.10	610.56

Recommendation: Investigate the Low Supply

Denver, Boston and Washington have the lowest supply of listings.

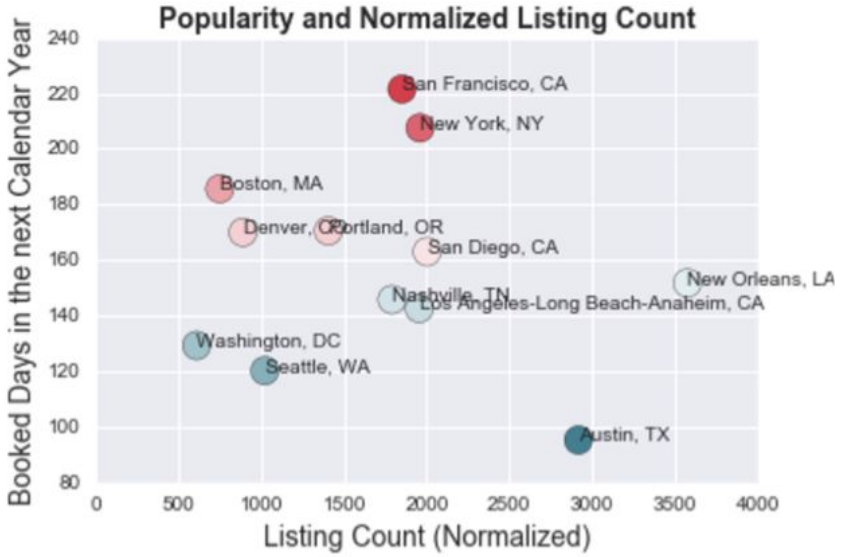
- Look into other data sources and test why this is.
- A solution: Implement a marketing plan to engage more of the population in listing their homes on Airbnb. This may involve targeting users who live in this area with an email or website copy that gets them to consider doing so.

‘Supply’ and ‘Demand’ of Listings

‘Demand’ of a listing in this context can be estimated by the popularity of a city to visit, indicated by the availability of a listing in the next calendar year.

The Takeaway:

Airbnb appears to be doing a good job matching the average supply and demand of listings, according to estimators here. The demand and supply of listings seems to follow a consistent upward trend.



Recommendation: Look at the Outliers

Outliers are New Orleans and Austin, there are far more listings for the population given the demand.

- Airbnb may want to investigate this further and possibly implement marketing strategies to get users to consider traveling to these destinations. This could involve changing website copy so that the main page features listings in these two cities, more people will click through and consider traveling to these places

Popularity Indicators:
Which cities are the most popular to stay in an Airbnb listing?

Measuring Popularity

Average Booked Days in the next Year:

The higher the average number of booked days, the more popular a city's listings are.

Location	Avg. Number of Reviews
Portland, OR	32.64
Nashville, TN	25.44
New Orleans, LA	24.72
Seattle, WA	22.22
San Francisco, CA	19.69
Boston, MA	19.04
Denver, CO	18.54
Los Angeles-Long Beach-Anaheim, CA	16.85
Washington, DC	15.31
New York, NY	14.53
San Diego, CA	14.05

Average Number of Reviews:

A proxy for estimating how frequently the listing is booked. The more reviews, the more times it is booked and the more popular it is.

Location	Avg. Availability to Book in next 365 Days
San Francisco, CA	221.50
New York, NY	207.53
Boston, MA	185.65
Portland, OR	170.48
Denver, CO	169.99
San Diego, CA	163.02
New Orleans, LA	151.74
Nashville, TN	145.80
Los Angeles-Long Beach-Anaheim, CA	142.58
Washington, DC	129.30
Seattle, WA	120.23
Austin, TX	95.26

Takeaway: Seattle has well valued listings

Seattle jumps from the bottom of the list on availability to the top on average number of reviews. .

- Although Seattle is not a popular place for travelers relative to the other cities included in the data set, it is well reviewed, all on average. This may be an indication of the superior value of Seattle Airbnb listings.

Popularity and Price

A correlation coefficient of .34 tells us that on average, the more popular a listing (higher the number of days booked) the higher the price of the listing.

Takeaway:

Cities where it is more popular to travel have high demand, which drives up price, on average.

If Airbnb can track booking dates of different cities over time, it can identify cities where booked dates are increasing in the upcoming calendar year. Using this information, they can identify where prices are going to be driven up by demand.

Recommendation: Austin as an Outlier

As a major outlier Austin was removed from this analysis.

- It has a high price, high availability, the least number of booked days and second highest listing count.This suggests that on average and relative to the other cities in this analysis, Austin is overpriced and over saturated given its popularity.
- Why is Austin such an outlier? Airbnb should look into trends in their data that can explain this.

The Zillow Home Value Index

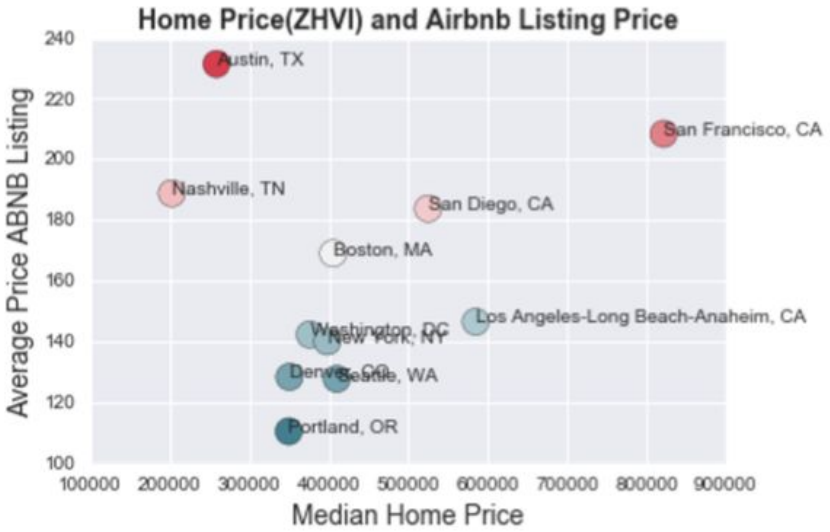
The ZHVI

The Zillow Home Value Index is an estimate for the median value of homes across America.

Zillow estimates sale prices on every home in a geographic area. The index is then created using the sale price from every home. This means Zillow has estimated sales prices for all home whether they sold, or not.

Using this methodology, the ZHVI is a comprehensive benchmark of home value trends immune to the changing mix of properties that sell in different periods of time

How does Median Home Price impact the price of Airbnb Listings?

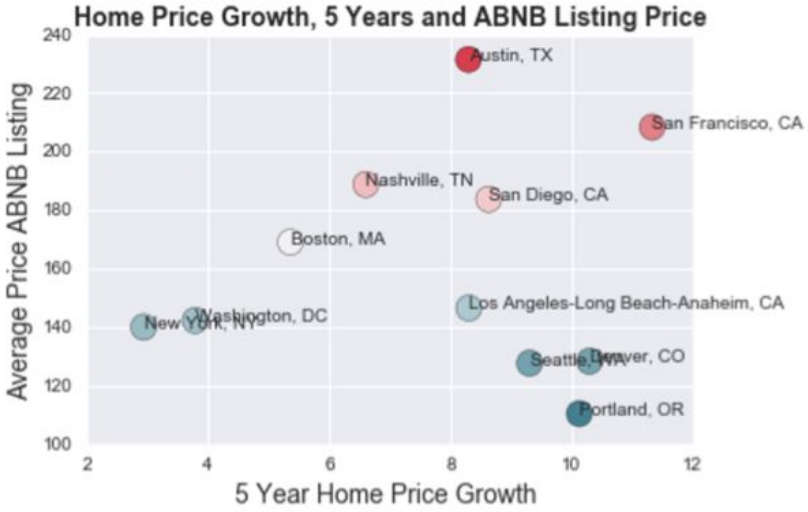


Takeaway:

As the average price of a listing increases as the median home value increases, as measured by the Zillow Home Value Index.

Nashville and Austin are two outliers, with low median home values and high average listing prices. By dropping these two outliers we increase our correlation coefficient between ZHVI and average List Price from .11 to .81, confirming a very strong relationship.

How does the change in home price over five years correlate to the price?



Takeaway:

A little over half the data follow the relationship of the average listing price increasing as home value increases.

Cities not following the trend include LA, Seattle, Denver and Portland.

- They have had high growth in home values over the last five years yet have maintained relatively low prices.

Predicting Listing Price:
Airbnb Data and the ZHVI

The Model

This is the initial model developed to predict the price of an Airbnb listing given listing data and the ZHVI.

Feature	Coefficient
Zhvi	8.83E-05
number_of_reviews	-6.692230095
availability_365	1.926249724
reviewtotal	0.704794579
10Year	-379.3361971
5Year	88.82070895
accommodates	25.29388748
bathrooms	42.51968205

The Regression Coefficient:

The coefficient for each feature describes how much the listing price changes, on average, for a one unit increase in said feature net of all others.

Using the regression coefficient, we can derive insights and recommendations regarding the pricing of Airbnb listings.

Price & The Five Year Change in Home Value

Recommendation: Investigate Listings using the 5 Year ZHVI

Change in home value plays a significant role in determining the price of an Airbnb listing.

- Net of all other variables, the price of a listing increase by $88 for every one-point increase in home value over five years.Given that most listings are priced around $100, the fact that home value can impact the price by $88 indicates that it is a significant variable to investigate.

- Airbnb could utilize more granular listing data from wider range of US cities and develop a model that can use the 5 Year home value index to predict where prices will increase.
- In these areas it will be more profitable for hosts to open their homes to guests, and Airbnb could gain a larger foothold in those regions.

Price & Listing Size

Takeaway: Higher Value, Higher Price

Occupancy and number of bathrooms have a big influence on listing price, with large regression coefficients. This relationship demonstrates how hosts and guests value listings.

- Airbnb can use this data could be as a way to control the average price of listings in an area.
- If they want to create more listings at lower prices for certain cities, Airbnb could make hosts post listings that accommodate less people.
- It may be a good next step to segment the data based on the size of listings to determine if there are more relationships to explore.

Limitations and Conclusion

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Limitations:

The model and exploratory analysis conducted only provided an interesting look into popular travel destinations in the US.

However, improved correlations and clearer relationships could be established with more listing information from a wider variety of cities.

Additionally, the conclusions established from this analysis would also be more significant.

Conclusion: Next Steps

A Broader Look at America

Take this analysis beyond major cities and travel destinations in the US.

The data used here does not provide a look into the nature of the Airbnb market in midsized or smaller cities.

There could be an untapped market for short-term rentals or local travel in these areas that should be explored.

Site Interaction Data

Supplement listing data with user web page behavior for each listing (how many clicks a listing gets, how long it is viewed etc.)

Airbnb is an online product. The way that users interact with the 'service' online is an important part of the experience.

Web data could reveal insights into the way users value listings in differently depending various characteristics of their trip.