What Drives Higher Airbnb Listing Prices in Seattle?

Exploring Price Trends and Patterns Using 2016 Seattle Airbnb Open Data



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## **Introduction**

Entering the Seattle rentals market can be a lucrative opportunity for entrepreneurs. Understanding which features of properties or potential investment properties can command higher prices is crucial for maximizing returns and ensuring a steady stream of passive income.

There are many factors that can influence the pricing of Airbnb listings, and it can be challenging to determine which ones are most significant. This analysis aims to shed light on these factors by exploring Airbnb data for Seattle. We focus on three main questions:

1. **Price Differences by Property Type:** Are certain property types consistently priced higher than others?
2. **Monthly Price Trends:** Do prices fluctuate significantly across different months?
3. **Key Determinants of Price:** What are the primary factors driving price variations? Which features - such as property type, amenities, and location - are most closely linked to higher or lower prices?

By answering these questions, we aim to provide insights for hosts looking to optimize their pricing strategies and for guests navigating the Airbnb market. To achieve this, we analysed data from Airbnb listings in Seattle for the year 2016. This dataset includes a wide range of information about each listing, such as property type, location, amenities, and pricing. By examining this data, we can identify trends and patterns that can help inform decision-making for both hosts and guests.

Our analysis covers several key areas:

* Overall Distribution of Prices: Understanding the general pricing landscape for Airbnb listings in Seattle.
* Differences in Prices by Property Type: Identifying which property types tend to command higher prices.
* Differences in Prices by Month: Exploring how prices fluctuate throughout the year.
* Determinants of Price: Analysing the factors that are most strongly associated with listing prices.

Through this analysis, we aim to provide a clear picture of the Seattle Airbnb market and offer insights for those looking to enter or navigate this space.

## **Overall Distribution of Prices**

Possibly one of the first questions for any potential investor would be “How much could I expect to rent out my property for?”. For a potential guest, it might be similar, “What should I expect to pay for a rental in Seattle?” or “With my budget, what type of properties can I afford to rent?”.

Thankfully, this question can be broadly answered by considering the distribution of listed properties prices in Seattle (**Figure 1**). From the figure, we see that most properties have listed prices around US$100 per night, with a median price of $107 and a mean of $137.67. There are some properties with much higher listed prices (more than $700) but for all intents and purposes, investors and guests should expect to pay around $110 for an average property.

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| **Figure 1:Relative Frequency Histogram showing the distribution of listed property prices in Seattle.** |
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**Do Prices Differ by Property Type?**

Now that we have a general idea of what one should expect to pay for an average property, we might be interested to see the types of properties available and what we should expect to pay for them. Perhaps an investor is considering an apartment. Should they expect a higher return on it, on average, compared to a bed & breakfast? If a guest is interested to sleep on a boat, would that leave them more out of pocket, on average, compared to a cozy cabin? **Table 1** can answer these questions. This presents summary statistics for Airbnb property listing prices in Seattle, categorized by property type. There is no shortage of property type options, with 16 property types, ranging from Boats to Yurts to choose from.

As already seen, the median and mean price across all properties was $137.67 and $107 respectively. Boats stand out with the highest mean and median prices ($328.83 and $150, respectively), but they also exhibit substantial variability in terms of the spread of possible prices (with a standard deviation of $270.09). In contrast, dorms have the lowest average price at $39.35, with minimal spread (standard deviation of $2.16). Houses and condominiums also show considerable price variability, with standard deviations of $123.32 and $113.90, respectively.

Compared to the overall median price, boats ($150.00), condominiums ($140), and apartments ($119.00) have higher median prices, highlighting the premium associated with these property types.

| **Table 1: Summary statistics of listed Airbnb Properties in Seattle by Property Type** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Property Type** | **Mean Price (US$)** | **Median Price (US$)** | **Min Price (US$)** | **Max Price (US$)** | **Std Dev Price (US$)** |
| All Properties | 137.67 | 107.0 | 10.0 | 1650.0 | 104.86 |
| Boat | 328.83 | 150.0 | 75.0 | 775.0 | 270.09 |
| Condominium | 167.62 | 140.0 | 41.0 | 800.0 | 113.90 |
| Apartment | 137.86 | 119.0 | 12.0 | 939.0 | 80.67 |
| Loft | 134.14 | 100.0 | 25.0 | 450.0 | 79.42 |
| Yurt | 105.36 | 100.0 | 100.0 | 120.0 | 8.88 |
| Cabin | 114.51 | 99.0 | 40.0 | 350.0 | 60.10 |
| Camper/RV | 126.12 | 99.0 | 42.0 | 375.0 | 95.02 |
| Bed & Breakfast | 115.08 | 95.0 | 26.0 | 420.0 | 64.99 |
| Bungalow | 122.97 | 95.0 | 53.0 | 500.0 | 81.80 |
| House | 137.58 | 95.0 | 10.0 | 1650.0 | 123.32 |
| Townhouse | 131.14 | 90.0 | 28.0 | 788.0 | 99.45 |
| Other | 105.39 | 88.0 | 35.0 | 272.0 | 54.07 |
| Tent | 56.96 | 65.0 | 25.0 | 65.0 | 16.04 |
| Chalet | 93.64 | 62.0 | 62.0 | 135.0 | 35.05 |
| Treehouse | 64.42 | 48.0 | 48.0 | 200.0 | 43.10 |
| Dorm | 39.35 | 38.0 | 38.0 | 47.0 | 2.16 |

**Figure 2** illustrates the distribution of listed prices by property type, highlighting the pronounced skewness in prices across different categories. There is a diverse range of prices within certain property types, which could reflect variations such as luxury, premium, and standard offerings. This is particularly evident in boat prices, which display two distinct segments: a luxury tier centred around $700 and a standard tier around $150. House prices also exhibit significant variability, as indicated by the extreme outliers and long, thin tails in the violin plot.

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| **Figure 2: Violin plot showing the distribution of listed property prices for Seattle Airbnb listings by property type.** |
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Now, one might be interested to determine whether there are statistically significant overall differences in average prices across property types. Here we employ the non-parametric Kruskal-Wallis H-test due to the highly non-normal and skewed nature of the data. The test yields a p-value of < 0.001, indicating significant differences in the mean ranks of prices among property type groups.

As the Kruskal-Wallis H-test is an omnibus test, it does not specify which pairs of property groups differ. To pinpoint these differences, we use Dunn’s test with Bonferroni correction to adjust for multiple comparisons and control Type I errors. **Figure 3** highlights significant p-values (shaded in green) from Dunn’s Test with Bonferroni Adjustment. This shows that most property types exhibit significant price differences. Notable exceptions include:

* Apartments and yurts, which do not show significant differences in mean rank prices.
* Bed & Breakfasts, which do not significantly differ in mean rank prices compared to bungalows, cabins, campers/RVs, houses, townhouses, and yurts.

What does this mean? Well, if you’re an investor and want to get a high listing price, it might be worthwhile considering a boat or house in the luxury category. If you’re a guest on a strict budget, a dorm, treehouse or chalet may be easier on the pocket.

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| **Figure 3: Heatmap of Significant P-Values from Dunn’s Test with Bonferroni Adjustment** |
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## **Are Some Months More Expensive than Others?**

Another pertinent question for investors might be in which months one should expect higher listing prices. For budget savvy travellers, they may be interested in visiting the city when prices are lower. Although the time span of the available data under consideration is limited, we can still analyse average monthly prices to identify any months with significantly higher prices compared to the yearly average (see **Table 2** and **Figure 4**).

From the table and figure, one can see that prices of listing peaked during the Seattle summer months. June averaged $149.92, July $154.33, and August $151.89. Conversely, the lowest prices were observed in the coldest months of January ($118.58), February ($123.70), and March ($128.42). Furthermore, **Figure 4** shows that the mean monthly prices of listings for January-April are below the yearly mean price, while the months of May-September are higher than the mean yearly price.

| **Table 2: Summary statistics of Prices of Listed Airbnb Properties in Seattle by Month.** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Period** | **Mean Price (US$)** | **Median Price (US$)** | **Min Price (US$)** | **Max Price (US$)** | **Std Dev Price (US$)** |
| 2016 | 2016 | 137.67 | 107.0 | 10.0 | 1650.0 | 104.86 |
| 2016 | January | 118.58 | 99.0 | 12.0 | 1000.0 | 85.76 |
| 2016 | February | 123.70 | 100.0 | 20.0 | 1000.0 | 91.69 |
| 2016 | March | 128.42 | 100.0 | 20.0 | 1099.0 | 93.43 |
| 2016 | April | 132.98 | 109.0 | 20.0 | 1099.0 | 96.01 |
| 2016 | May | 140.58 | 110.0 | 20.0 | 1099.0 | 103.16 |
| 2016 | June | 149.92 | 115.0 | 20.0 | 1099.0 | 115.51 |
| 2016 | July | 154.33 | 115.0 | 20.0 | 1240.0 | 121.68 |
| 2016 | August | 151.89 | 115.0 | 20.0 | 1250.0 | 119.19 |
| 2016 | September | 143.97 | 110.0 | 20.0 | 1450.0 | 109.29 |
| 2016 | October | 136.93 | 109.0 | 20.0 | 1650.0 | 104.19 |
| 2016 | November | 135.95 | 109.0 | 10.0 | 1650.0 | 104.26 |
| 2016 | December | 137.82 | 109.0 | 20.0 | 1650.0 | 105.03 |

To rigorously determine if a month’s average listing price is significantly greater than the yearly mean price, we perform a one-sample t-test with Bonferroni correction for multiple comparisons. The one-sided tests confirm that there is sufficient statistical evidence to suggest that the mean monthly prices for May, June, July, August, and September are greater than the yearly mean price for all listings. Conversely, the months of January through April and November are statistically significantly lower than the yearly mean price. So, if travellers are looking for bargains, they should restrict their search to January-April and November (if they can bear the bitter cold!). Investors or owners of property should expect higher returns in the summer months.

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| **Figure 4: Evolution of Mean Monthly Prices of Airbnb listing for Seattle (with 95% confidence interval).** |
| A graph with a line and a blue line  AI-generated content may be incorrect. |

## **Which Features of a Property Are Associated with Higher Prices?**

Now that we have explored how prices vary between property types and months of the year, we turn to the question of which features included in a property are associated with higher prices for that property. Are certain amenities associated with higher prices? Does the number of unique amenities drive up prices? Are there certain zip codes that drive different prices?

After some data exploration and cleaning, a subset of 172 features were considered to explain variation in the listed prices of properties in Seattle. These were included in a linear regression on a training and test set. These yielded an R-squared (goodness-of-fit statistic) of 0.640 and 0.638 respectively. This means that approximately 64% of the variability in the listed price can be explained by the included variables. There is also not a marked decline in the model performance when applied to the test set, which strengthens the generalizability of the model to new samples. However, if predictive accuracy is of paramount importance, it might be worthwhile to include additional features in the model.

**Table 3** shows the 20 features that have the biggest impact on price when comparing them fairly. One interesting finding is that the number of unique amenities in a property has the strongest link to price increases. A coefficient of 85 means that if a property has more amenities than usual - by about an average difference seen in the data - the price is expected to go up by 85 units. In simple terms, properties with more unique amenities tend to have higher prices, and adding more can make a noticeable difference.

Other key factors influencing price include the number of bedrooms (more bedrooms generally lead to higher prices), how many people a property can accommodate (larger capacity correlates with higher prices), and the number of bathrooms (more bathrooms typically increase price, but this could also move in tandem with the number of bedrooms since more bedrooms typically are associated with more bathrooms).

On the other hand, properties with private or shared rooms have large negative coefficients, indicating that they tend to be priced lower - likely because they are less exclusive and offer fewer amenities.

Interestingly, certain Seattle zip codes—98118, 98144, and 98117—show a negative association with price, which may warrant further investigation to understand why.

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| **Table 3: Table showing the top 20 variables in terms of their standardized effect in explaining listed prices.** | | | |
| **Feature** | **Coefficient** | **Absolute Coefficient** | **Rank** |
| unique\_amenities\_count | 85.09 | 85.09 | 1 |
| bedrooms | 26.07 | 26.07 | 2 |
| accommodates | 22.94 | 22.94 | 3 |
| bathrooms | 19.67 | 19.67 | 4 |
| room\_type\_Private room | -17.11 | 17.11 | 5 |
| room\_type\_Shared room | -14.69 | 14.69 | 6 |
| Fire Extinguisher | -12.89 | 12.89 | 7 |
| TV | -11.16 | 11.16 | 8 |
| Hangers | -11.01 | 11.01 | 9 |
| Family/Kid Friendly | -10.49 | 10.49 | 10 |
| Pets live on this property | -10.3 | 10.3 | 11 |
| Carbon Monoxide Detector | -10.25 | 10.25 | 12 |
| zipcode\_98118 | -9.72 | 9.72 | 13 |
| zipcode\_98144 | -9.18 | 9.18 | 14 |
| Washer | -9 | 9 | 15 |
| First Aid Kit | -8.85 | 8.85 | 16 |
| Free Parking on Premises | -8.81 | 8.81 | 17 |
| Laptop Friendly Workspace | -8.68 | 8.68 | 18 |
| 24-Hour Check-in | -8.28 | 8.28 | 19 |
| zipcode\_98117 | -8.03 | 8.03 | 20 |

**Conclusion**

This analysis of Seattle Airbnb data reveals several key insights into pricing trends and determinants. Property type significantly influences listing prices, with boats, condominiums, and apartments commanding higher prices. Seasonal variations are evident, with summer months showing higher average prices compared to the rest of the year. Additionally, the number of unique amenities, bedrooms, and bathrooms are strong predictors of price, while private and shared rooms tend to be priced lower.

For hosts, understanding these trends can help in setting competitive prices and maximizing occupancy rates. Potential guests can use this information to find the best deals based on property type and timing. Overall, this analysis provides an overview of the potential factors driving Airbnb prices in Seattle, which could offer valuable guidance for both hosts and guests.