

# Canadian Real Estate Rental Market – Artificial Hype or Reality?

## Airbnb vs Traditional Rental Market

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### ABSTRACT

Airbnb is an online marketplace that enables people to list, discover, and book unique accommodations ranging from homes to castles all around the world. Airbnb has **19,255** listing in Toronto, Montreal has **19,495** and Vancouver has **4,273** listings available for rent. Considering these numbers; **should Toronto council regulate Airbnb, home rental websites?** Authorities are concerned to regulate Airbnb to release occupied houses into Toronto real estate market to compensate the housing crisis in Toronto.

Recently, an artificial hype in real estate rental market has been observed, especially over the period of past 5 years, whereby the rental of a reasonable accommodation is almost out of budget for a middle class. The Government of Canada has been taking initiatives to increase the availability of rental property in mega cities of Canada e.g. Vancouver and Toronto.

**“The City of Vancouver announced on Wednesday that it is moving to ban all Airbnb and short-term rentals in secondary homes in the city. Mayor Gregor Robertson says they expect about 1,000 rental units to get returned to the market.”** [1] In continuing efforts to crack down upon short term rental loom through Airbnb, Toronto passes strict Airbnb rules aimed at preserving long-term rental supply [2].

The goal of this project is to analyze how this short-term rental service Airbnb is causing a shortage in long term rental vacancies. Underlying assumption is that it has also inflated the hype in rental market. This project is an in-depth exploratory and diagnostic analysis of an interesting dataset that provides insights of the data combined with a data analytics and visualization solution that can be scaled to massive datasets.

The geographical scope of this study is Canada, specifically Vancouver and Toronto. This project aims to analyze percent increase in rental [2] of apartments of different size and vacancy rate, in two mega cities of Canada. We will also get an insight of ownership of house(s) e.g. how many houses or secondary house units are on listing for short term rental through Airbnb platform.

The motivation to conduct this rigorous Data Analysis is to conduct in depth study of Airbnb operations in Montreal and Toronto. That includes comparison of rent among same type of property and

between the two major cities, Ownership of houses by hosts, Seasonal Occupancy and comparison of number of bookings in both cities. This study might give us further insight about most favorite houses.

This comparison of rent rates between the two markets may provide further insight about more attractive market for home owners.

Another interesting dimension is to predict future of Airbnb; whether Airbnb will expand its operation across Canada or it will continue with limited operations or what is next user's desired destination(s). We are trying to establish a connection between multiple datasets pertaining to Toronto real estate (rental) market and Airbnb rental market to evaluate the hypothesis, if Airbnb has a real time effect of long term or short term rental market in Canada.

### KEYWORDS

Analytics, Visualization, Short & Long Term Rental, Investment, Vacancy, Availability, Income, and Seasonal rent, Seasonal Occupancy, Airbnb, Occupancy Model, Tourism, Airbnb; sharing economy; price; GWR; factors

### 1 Problem Definition:

This project aims to explore and conduct an in depth analysis of Airbnb Market in Canada with focus on Toronto and Montreal. The rationale to choose these two cities out of three cities in Canada is large number of the listings on Airbnb. Toronto's low vacancy rates could have something to do with the city's large quantity of Airbnb listings. As many as 6,500 Toronto homes are listed on Airbnb a number that has almost doubled since 2016.

The goal of this study is to analyze how this short-term rental service Airbnb is the cause of housing crisis in Toronto. Underlying assumption is that this big number of Airbnb listings has also inflated the hype in rental market. This project is an in-depth exploratory and diagnostic analysis of an interesting datasets related to two entities e.g. Airbnb and Toronto Real Estate market (Canadian Mortgage and Housing Corporation (CMHC)). We are trying to investigate the motivation of hosting private houses on Airbnb; is there any difference in average rent between the two markets or there is another motivation?

### 1.1 What is inside this Data

The data source for this project is: Statistics Canada, Canadian Income Survey 1990–2018, Survey of Labor and Income Dynamics 1990–2018. This data is publicly available on Canadian Mortgage and Housing Corporation (CMHC) [3].

Another data source for this project is “Inside Airbnb”. The data behind the Inside Airbnb Web Portal is being sourced from the publicly available information provided by Airbnb.<sup>4</sup> This data is available from **June 07, 2015 to December 6, 2018**. There is no data available prior to 2015 on public.

### 1.2 Exploratory Data Analysis

This part of report is different types of analysis to understand the data, trend(s) and any hidden or unidentified patterns by performing **TYPE I** and **TYPE II** analysis to get insight on data dimensions and details under analysis. We will discover data types of the dataset; whether continuous/discrete/categorical. Understanding how the data is distributed and to identify outliers.

#### 1.2.1 The dataset comprises of three main tables:

**Listings** - Detailed listings data showing 96 attributes for each of the listings. Some of the attributes used in the analysis are price(continuous), longitude (continuous), latitude (continuous), listing\_type (categorical), is\_superhost (categorical), neighborhood (categorical), ratings (continuous) among others.

**Reviews** - Detailed reviews given by the guests with 6 attributes. Key attributes include date (date time), listing\_id (discrete), reviewer\_id (discrete) and comment (textual).

**Calendar** - Provides details about booking for the next year by listing. Four attributes in total including listing\_id (discrete), date(date time), available (categorical) and price (continuous).

#### 1.2.2 Data Cleansing Process:

The details about data cleaning process and tools will be completed in final report.

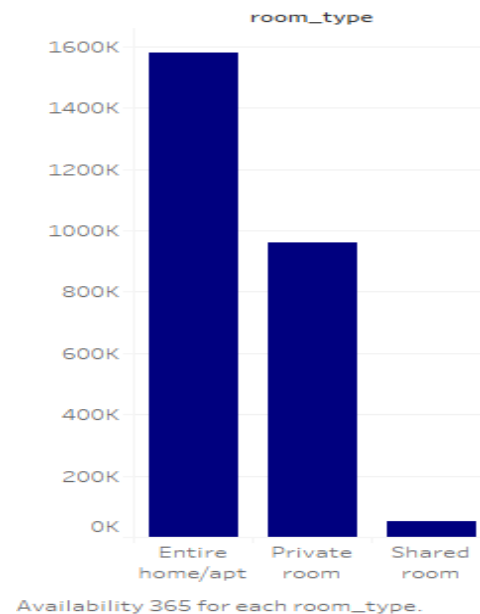
#### 1.2.3 TYPE I Analysis

This part of our analysis

The histogram below is the visual presenting availability of three different types of property such as Entire House/apartment, Private Room and Shared Room over the period of 365 days. The data seems to be Normal Distribution.

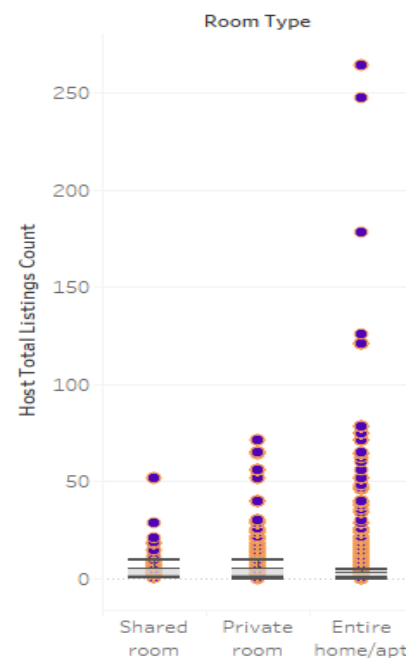
This box and whisker plot visualizes the listing count per host and it turns out that one host owns 264 houses that is 41%, ownership of Private room is 72 rooms per person that is 21.7% and shared room is 31% of all listings in Toronto.

**Airbnb Listings Availability 365 Days**



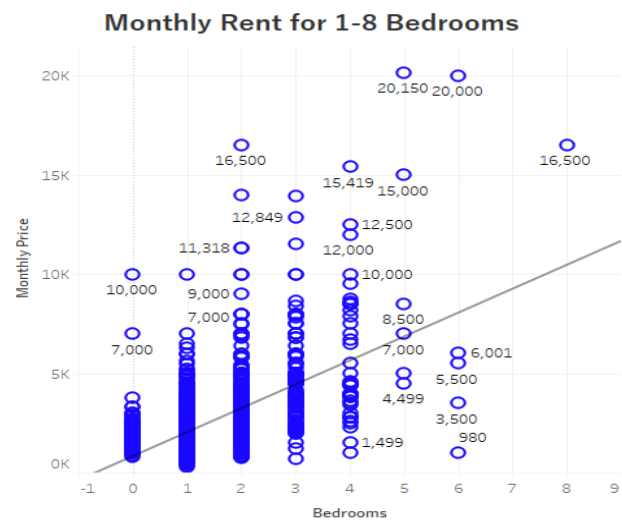
**Figure 1 Histogram of availability of different types of property over 365 days**

**ListingCount\_Per\_Host**



Airbnb listings have approximately 5 bedrooms and monthly rent is about 15000 per month whereas on monthly lease it is between 3000 – 3500 CAD per month.

The scatter chart below shows the monthly rent for 1-8 bedrooms. Five bedroom is rented for 20,150 and 6 Bedroom house is rented for 20,000



Bedrooms vs. Monthly Price.

Figure 3 Monthly Rent vs. Bedrooms.

Long term properties see a price density peak shifting with increasing unit size. Most of the Bachelor rooms have a price around 700, while one bed 1000, two bed around 1200. In case of three bed we see two peaks one at 1300 and other at 1500. This exhibits the true case, as Toronto has a lower price range for three bed but number of this property is only 30% of the whole 3 or more bed apartments.

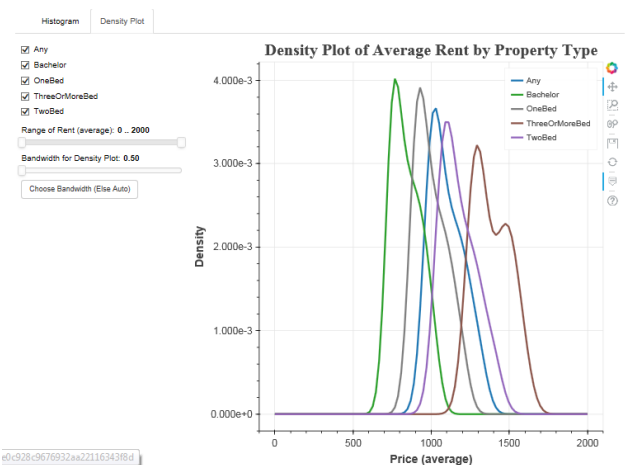


Figure 4: The density plot of average rent by property type.

The scatterplot matrix below, is the visualization of pairwise correlations for multi-dimensional data; each cell in the matrix is a

scatterplot. The scatter plot matrix below is a comparison of Monthly, weekly and per night rent of listings on Airbnb in Toronto. However, there is data for approximately 2000 records and 17k hosts have not provided this information.

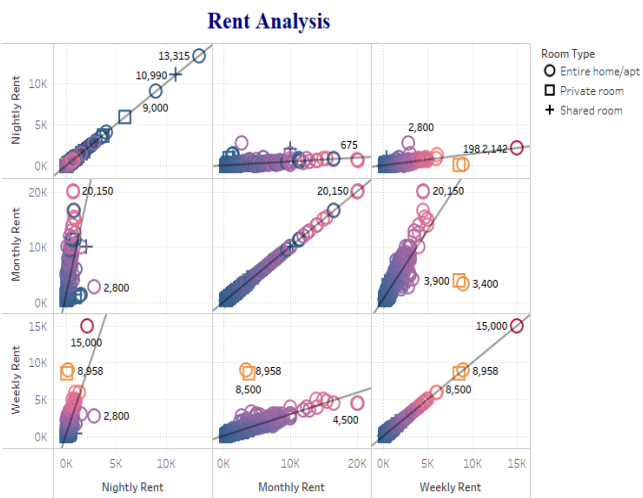


Figure 5 Airbnb Rent Analysis

This linear regression (below) fit in the center along with each parameter histogram and density plot distribution in x and y axis describes the scenario that with a swelling rental cost, housing price index is falling. That means as Airbnb market is triggering inflation in the rental costing, housing index is getting lowered, which is in fact reducing investor's interest in investing long term properties.

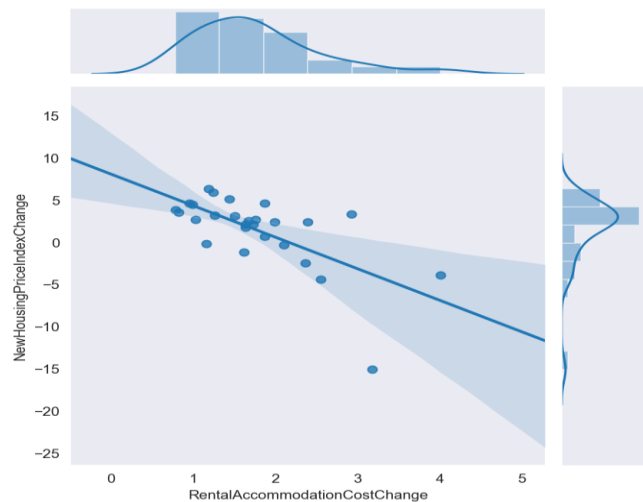
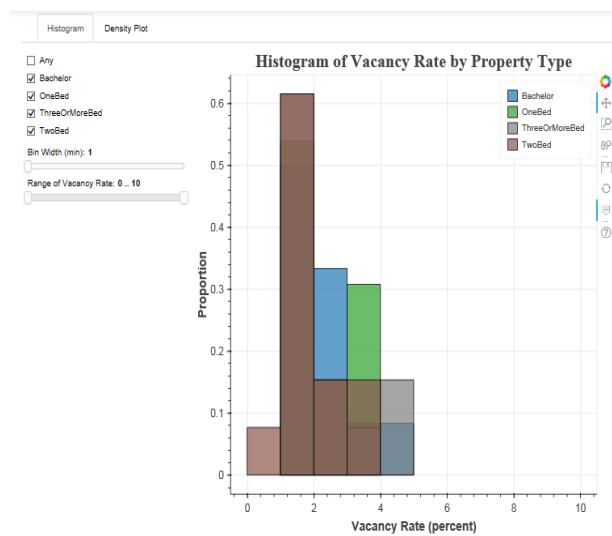


Figure 6: Joint Plot showing the changing pattern of investment policy

This histogram shows that different properties have overlapped distribution with each other. Maximum bachelor, one, two, three or more bed have 1-2% vacancies now a days. In comparison, 2 bed seems to have least vacancies, then bachelor, then one bed. But 3 or more beds have less vacancies than others.



**Figure 7: Histogram of long-term rental vacancies defined by property type**

In this bubble chart, the size of the circles easily represents that Toronto Central, Markham, Different parts of Mississauga, York, and Scarborough are in heavy rental demand. But Oakville, Bradford West, East Toronto, Aurora, Orangeville are more accessible to renters for long term lease.

**Variation of Long Term Vacancy Rate in Toronto**

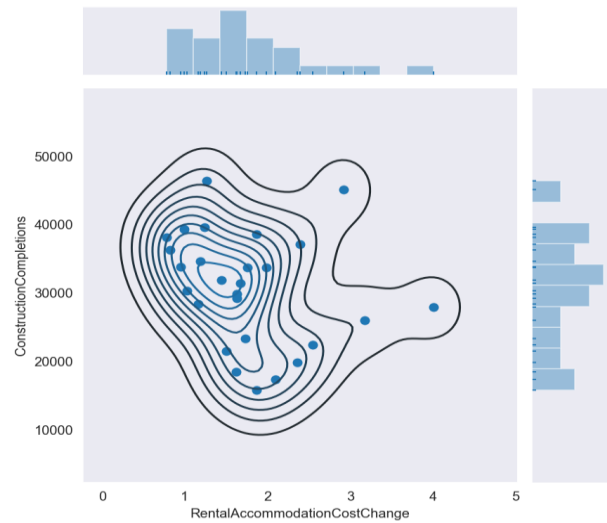


City. Size shows standard deviation of Vacancy Rate. The marks are labeled by City. The view is filtered on City

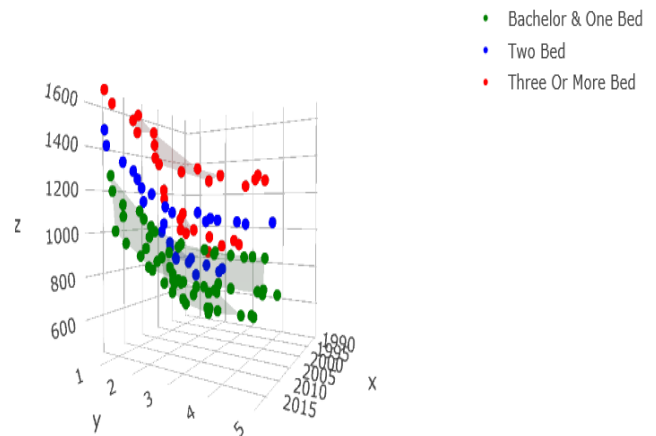
**Figure 8: Long-term vacancies of Toronto shown by areas.**

The figure combines univariate histograms and bivariate kde plots. Center kde plot show us that every year the construction of housing that goes under completion have natural grouping with rental cost change with a center of 1.5%. As the distribution of costing gets

higher, the more complete housings are coming into market, leading to rental cost inflation.

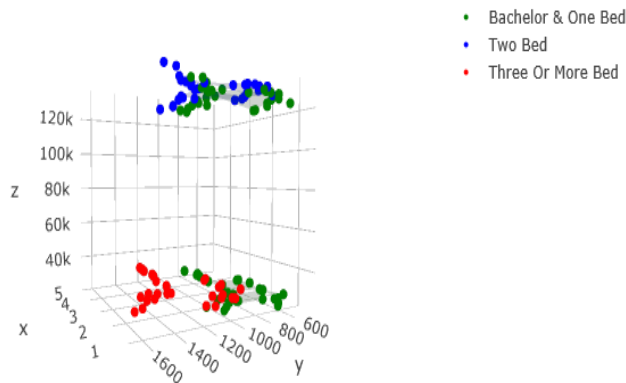


**Figure 9: Joint plot with center kde plotting of bivariate relationship of how new housing construction industry depends on rental cost change.**



**Figure 10 3D Clustering of Long-Term Rental Data by Chronological History, x=Year, y=Vacancy Rate, z=Average Rent**

This scenerio tells us that through out the year average rent of all types of rooms are increasing while the vacancy rates are decreasing and the trend is linear for all types of properties.



**Figure 11 Clustering 3D Plot by x=average rent, y=vacancy rate, z=number of units**

Here we see that Bachelor and One bed number clustered as green has similar price and vacancy rate, but the available number of units of bachelor room is below 40K as that of three or more bed room. Toronto has nearly same number of one and two bed apartments for long term rent. One bed and two bed prices and vacancy rate are in the same range of 600-1200 and 1-4%. 3 or more beds with lower price range have a low vacancy rate but Toronto has only 30K numbers of these types while the others with price range of 1200-1500 have high vacancy rate.

### 1.3 Type II Analysis

This part of our study includes the prediction model e.g. Time Series Regression for predicting a future response based on the response history (known as autoregressive dynamics) and the transfer of dynamics from relevant predictors.

#### 1.3.1 Predictive Model

Our prediction will include the time period of 3-5 years for both Airbnb and Toronto real estate market. Our prediction includes:

- Next favorite destination of visitor in Canada
- Predict the nightly, weekly and monthly rent for listings on Airbnb for next 2-5 years (trend analysis).
- Predicting the Listing Price/rent of Airbnb and Long Term Rental
- Word frequency and cloud computation of the owners and give similar content based Recommendation for the user
- Seasonal Price Pattern of Airbnb
- What kind of properties will be listed on Airbnb
- sentiment analysis of reviews
- Prediction of User ratings

#### 1.3.2 Cluster Modeling:

Clustering approach will be developed for Toronto Airbnb reviews, in the English language, collected since 2015 - 2018. Further details to be identified.

Another analysis will be density map clustering would be to plot the pricing data in terms of density and expensiveness on the map of Toronto. The variable will be used

- Rent per night
- City
- Longitude
- Latitude
- Joining Date( month and year)
- Number of bedrooms
- Property description
- Property title
- Property URL

### 1.4 Related Work

To best of our knowledge, despite the fact there are different kinds of analysis to explore Airbnb data for Toronto; we have not come across such analysis that visualizes count of listings per host for Toronto. Also, the density map clustering with plotting of the pricing data in terms of density and expensiveness on the map of Toronto and Vancouver.

Airbnb has been intensely gaining popularity since 2015 due to its direct interactions with the local community and independence of usability of perimeter. This paper employed a general linear model (GLM) and a geographically weighted regression (GWR) model to identify the key factors affecting Airbnb listing prices using data Airbnb listings in Metro Nashville, Tennessee (Zhihua Zhang, 2017) . We will perform a similar analysis for a data set containing 19225 listing in Toronto and Vancouver in order to evaluate the key factors in determining the high price/ rent for Airbnb listings.

### 1.5 Methodology and Evaluation

We are in process of collecting further data to decide evaluation methodology either it is Hypothesis based analysis. Our hypotheses is:

**H<sub>0</sub>:** Airbnb has no effect on Toronto real estate market.

**H<sub>1</sub>:** Airbnb has effect on Toronto real estate market

We are considering to form few alternate hypotheses based on available data. That will be included in Final Report.

### 1.6 Glossary of Terms

#### Unit Types:

Entire Home – The guest has complete and sole access to the

Entire Unit during the stay.

Private Room – The guest has their own sleeping area, but shares access to the Unit's common areas with others.

Shared Room – The guest rents a common area, like an airbed or sofa in a living room.

Long Term Rental Units – Units listed and rented for 90 or 180+ days per year.

## **ACKNOWLEDGMENTS**

Canadian Mortgage and Housing Corporation [3], Airbnb [4]  
<http://torontostoreys.com>, 2019[5]

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