

Delving into Airbnb

Exposition

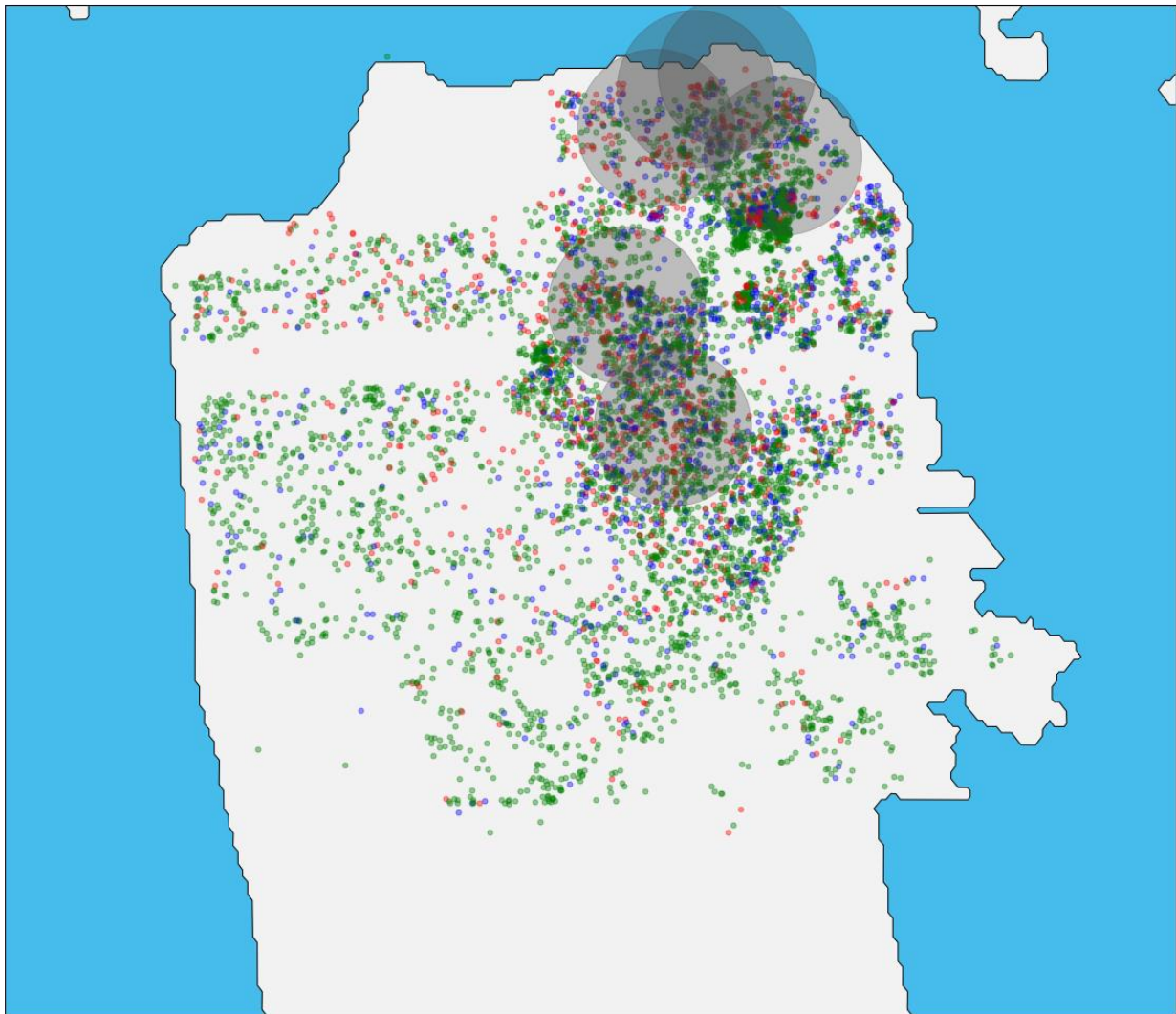
Since its founding in 2008, Airbnb has grown increasingly popular as one of the leading ways to stay around the world. Essentially, Airbnb's platform allows property owners to list their space for rental at their own price. In the month of May 2019, the average price for a night in an Airbnb listing was \$215—a price comparable to that one would pay for a hotel in the city. Unfortunately, as well-known Airbnb is, after 10 years of being in business, Airbnb has done more than just scare the lodging industry; many people have begun to push for regulation with the claim that Airbnb is negatively affecting housing markets around the world. In San Francisco, property owners in multiple neighborhoods—from residential areas like the Sunset district to Downtown—list their spaces for rent on Airbnb. In fact, in the month of May, there were 692 listings in the Mission district alone. While Airbnb helps make these travelers feel more at home by offering spaces in such neighborhoods, many argue that Airbnb is damaging housing affordability for those who actually want to live in the city for the long-term.

What exactly is the basis for such claims? First it is important to understand the ideas of a “short-term” housing market and a “long-term” housing market. The long-term market is simply what most people will search through to find housing with no specific end date in mind. For example, someone moving to San Francisco for a new job would be looking for a place to stay until they need to move somewhere else. On the other hand, the short-term market is where people who are simply visiting a city for a couple days or weeks will look. San Francisco defines a short-term rental as one that is 30 days or less in duration. When properties on the long-term market are instead placed in the short-term market, supply in the long-term market decreases while demand remains constant—driving prices up. This is burdensome for those seeking to move into a city for the long-term, and especially difficult for those who are already living in the city. This is especially an issue in San Francisco, where soaring living costs have led to a housing crisis leaving some homeless.

In fact, to help keep properties from the short-term market, San Francisco requires property owners renting out their property for less than 30 nights at a time to live in their home for at least 50% of the year. However, looking at the data, almost one-third of the listings seem to require short-term stays. Moreover, while a good portion of listings require a stay of 30 nights or more, the majority of listings on Airbnb allow renters to stay only a couple of days. Fortunately, city law has slowly been adapted to accommodate companies like Airbnb. In April 2017, Airbnb and the city of San Francisco reached an agreement that required all hosts listing a property for less than 30 nights at a time to officially register with the city as a short-term host. Following the introduction of this rule in April 2017, the number of licenses among San Francisco listings with maximum night caps of 30 nights or less skyrocketed in just one year from 17.3% to 97.4%. Today, 98.1% of these same types of listings have licenses. Case in point, the example of San Francisco shows the need for cities worldwide to update their existing law.

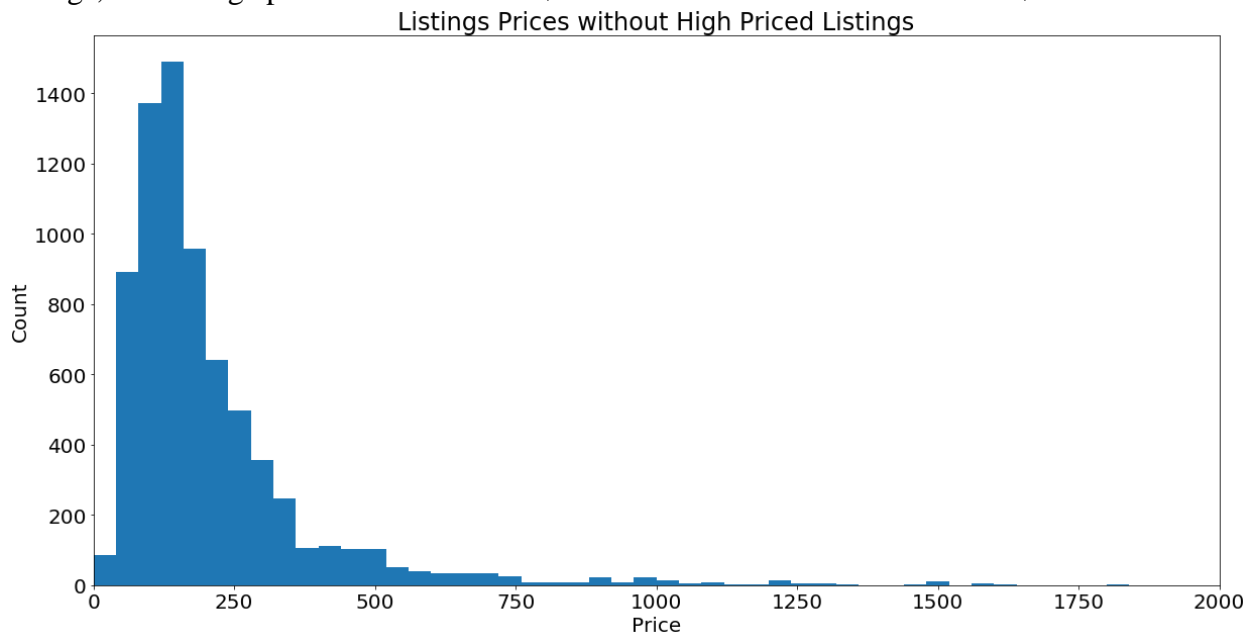
Methods and Analysis

While there are Airbnb listings in essentially all of San Francisco's neighborhoods, a simple breakdown of the listings by neighborhood shows that the majority of these listings seem to be located in the Mission, Downtown/Civic Center, Western Addition, and South of Market areas. Specifically, from a total of 7353 listings, 9.41% were located in the Mission district, 8.38% were located in the Downtown/Civic Center area, 8.17% were located in the Western Addition area, and 8.02% were located in the South of Market area. To visualize the distribution of these listings, a mapping of San Francisco was created. From this visualization, it appears that many of the listings also seem to be located near popular tourist hubs such as Fisherman's Wharf, Chinatown, Alamo Square, and Dolores Park. The map also color codes listings by price; those priced above \$300 are colored red, those above \$200 blue, and the rest green. Not surprisingly, while there are "expensive" and "cheaper" listings throughout the entire city, there seem to be a larger number of high-priced listings near these same neighborhoods and hubs. The owners of properties near these areas are likely targeting the demand that comes from tourists visiting the city, as such travelers prefer to locate themselves close to such popular spots.

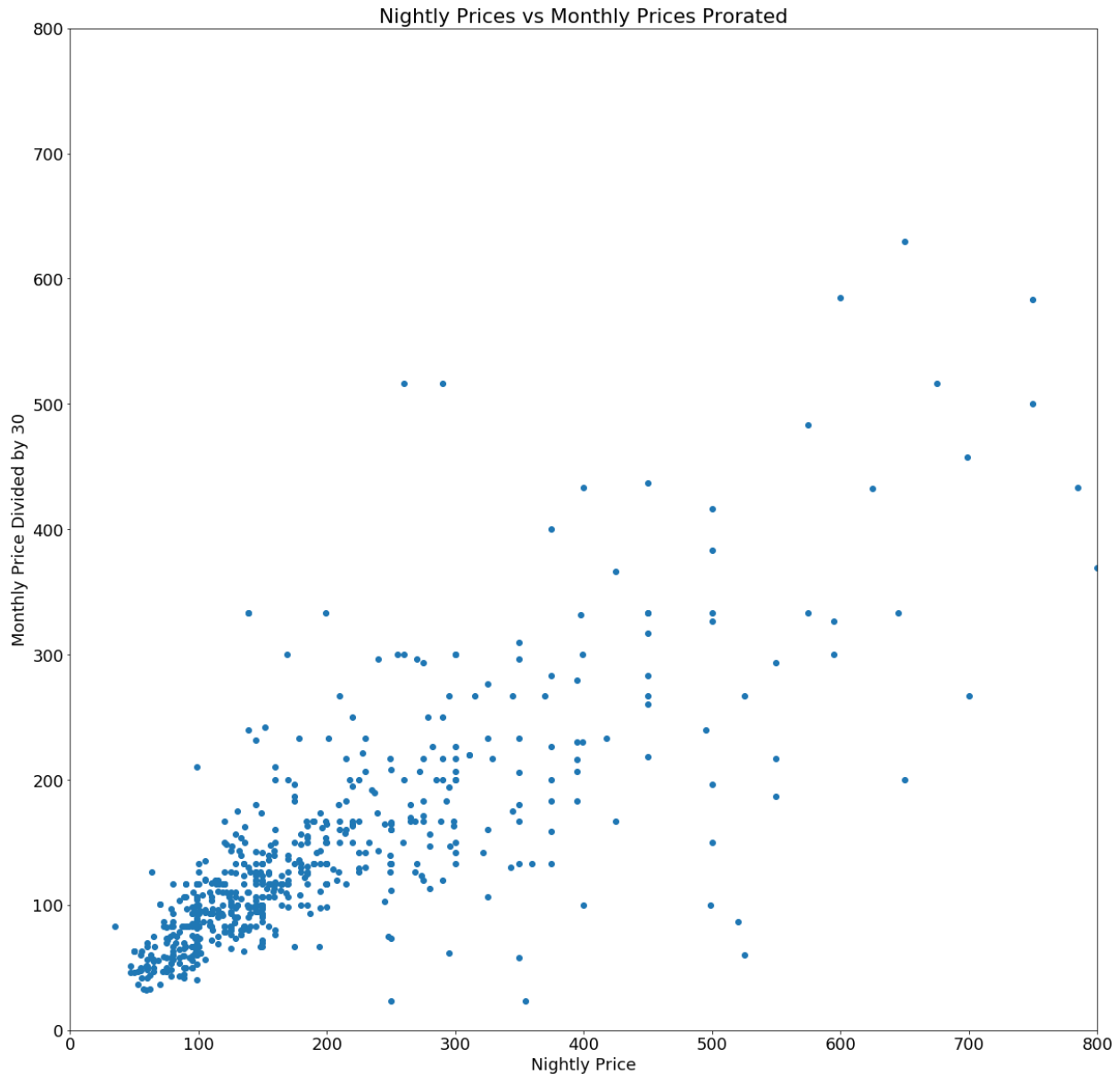


As for location of listings, a regression fitting the various neighborhoods to the price of a listing shows considerable differences in the price estimates. For example, a listing in the Mission area of San Francisco is estimated to have a nightly price of \$227, while a listing in the Financial District is estimated to have a nightly price of about \$315. However, the calculated R^2 value for this is only 1.607%. As such, this model does not seem to be very significant. This is likely because the neighborhood itself is not a good estimator for the price of a listing; as mentioned before, there are a variety of prices for the listings in any given area. On that note, comparing the means for these neighborhoods still seems to support the idea that different neighborhoods have more expensive/cheaper priced listings in general. The Mission area has an average price of \$224.4 a night, while the Financial District has an average of \$262.8 a night.

On the topic of price, the majority of listings seem to be priced below \$300 per night, with a few outliers that extend as far as \$8,000 per night. In fact, of the total 7353 listings, only 19 listings were priced greater than \$2000 per night. Including these listings, a typical Airbnb listing costs about \$215.96 per night with a standard deviation of \$266.65. Excluding these highly-priced listings, the average price comes down to \$207.25 with a standard deviation of \$184.68.



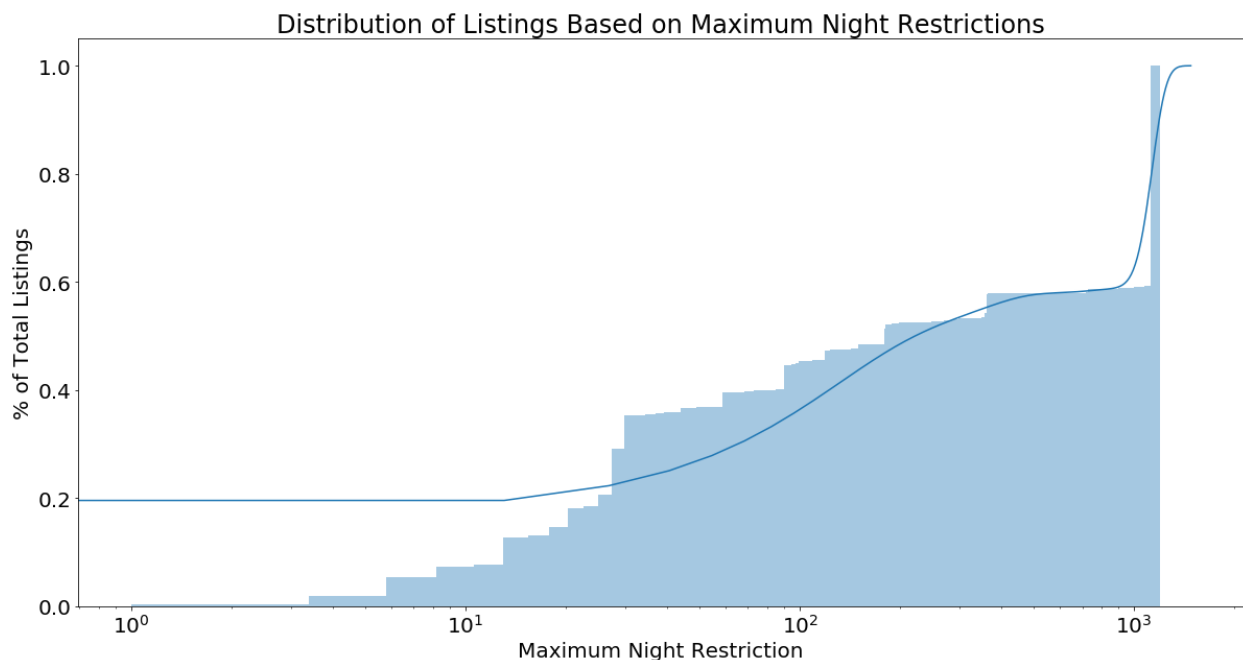
That aside, considering Airbnb allows property owners to quote a monthly price in addition to a nightly price, it would be reasonable to assume that those that include a monthly price might be cheaper when prorated per night compared to simply paying the cost per night for that entire month.



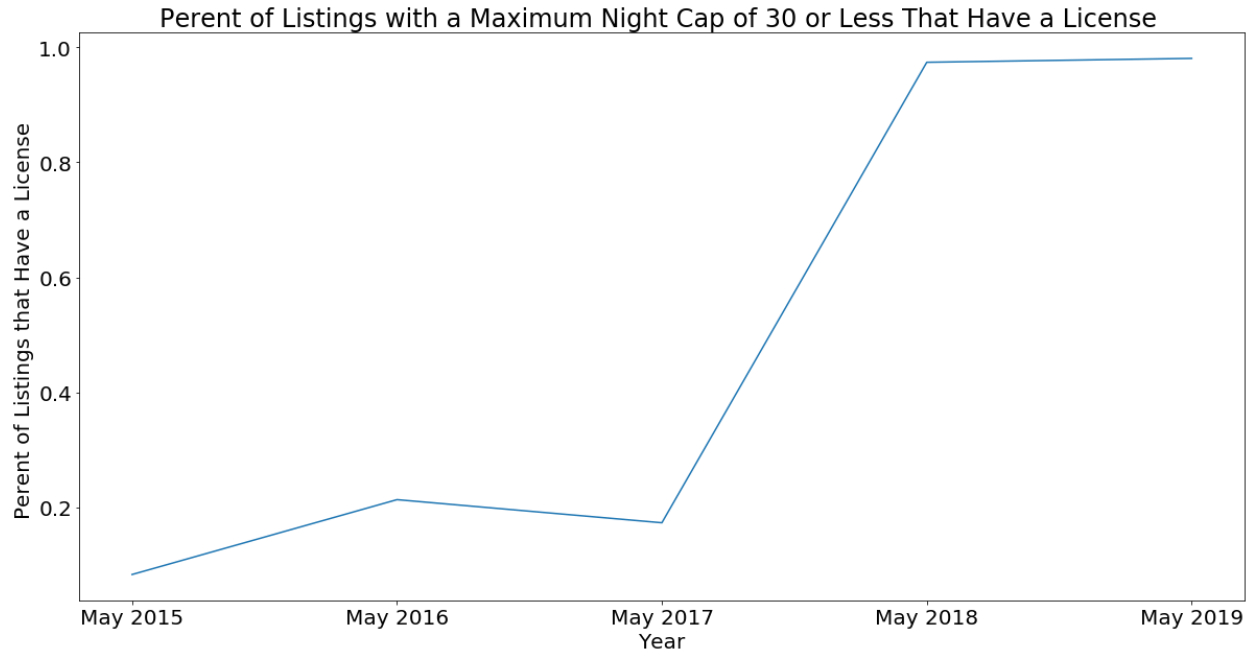
To explore this, the monthly price quoted is divided by 30 to arrive at the prorated per night cost. Looking at a scatter plot comparing the price to the prorated monthly price, it appears that several listings do indeed cost less per night when rented by the month. Specifically, 82.736% of the listings have a lower prorated price than the quoted nightly price; however, only 74.75% of all the listings have a prorated price that is \$10 cheaper or less than the quoted nightly price. With that in mind, it seems that property owners do partially subsidize longer stays at their properties. However, it is important to note that very few Airbnb listings even have a monthly price listed alongside the nightly price; only 15.1% of listings had a monthly price quoted. This

would support an assumption that Airbnb owners prefer to rent out in the short-term (less than a month) rather than the long-term.

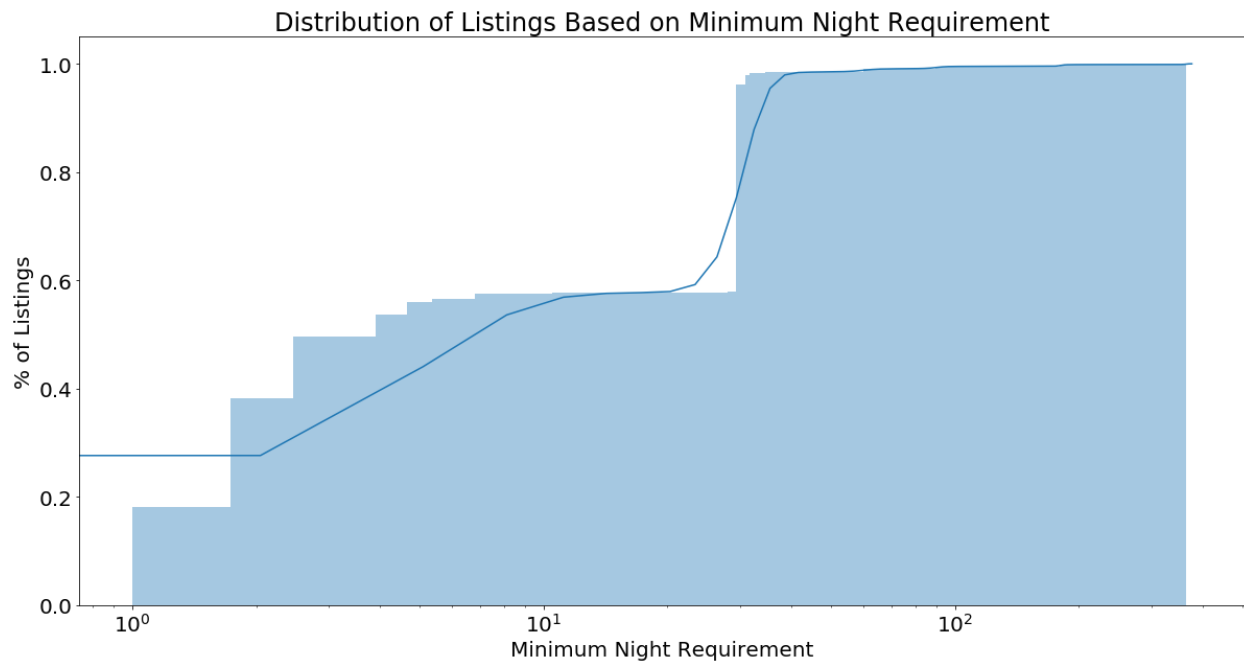
From here, it makes sense to look at the maximum night restriction and minimum night requirements for the listings. Starting with the former, a breakdown of the listings by maximum nights required shows that only 14 listings have a maximum night requirement greater than 1200 nights. Looking at a cumulative distribution function, it appears that a strong majority of listings—39.31%—have a maximum night restriction of 1125 nights. In addition, about 34.3% of the listings also seem to have a maximum night restriction of 29 and 30 nights. As mentioned before, San Francisco regulates rentals that are less than 30 days in duration as short-term rentals. This seems concerning considering 34.3% of the 7353 listings (2,500 listings) are basically renting in the short-term.



However, it is important to consider how many of these same listings also have official short-term licenses with the city of San Francisco. Specifically, of the 2525 listings in May 2019 that had maximum night caps of 30 nights or less, 2477—98.1%—had licenses. Of course, this was not always the case; plotting this same percentage over the years from 2015 to 2019, there seems to have been a drastic increase from May 2017 to May 2018 (see next page). This increase was likely the result of the introduction of the agreement between Airbnb and San Francisco to help regulate short-term listings on Airbnb. Another interesting point was the slight dip from May 2016 to May 2017. This may have been due to hosts deciding to simply take their listings off the platform, or alternatively increase their maximum night cap, out of non-compliance.



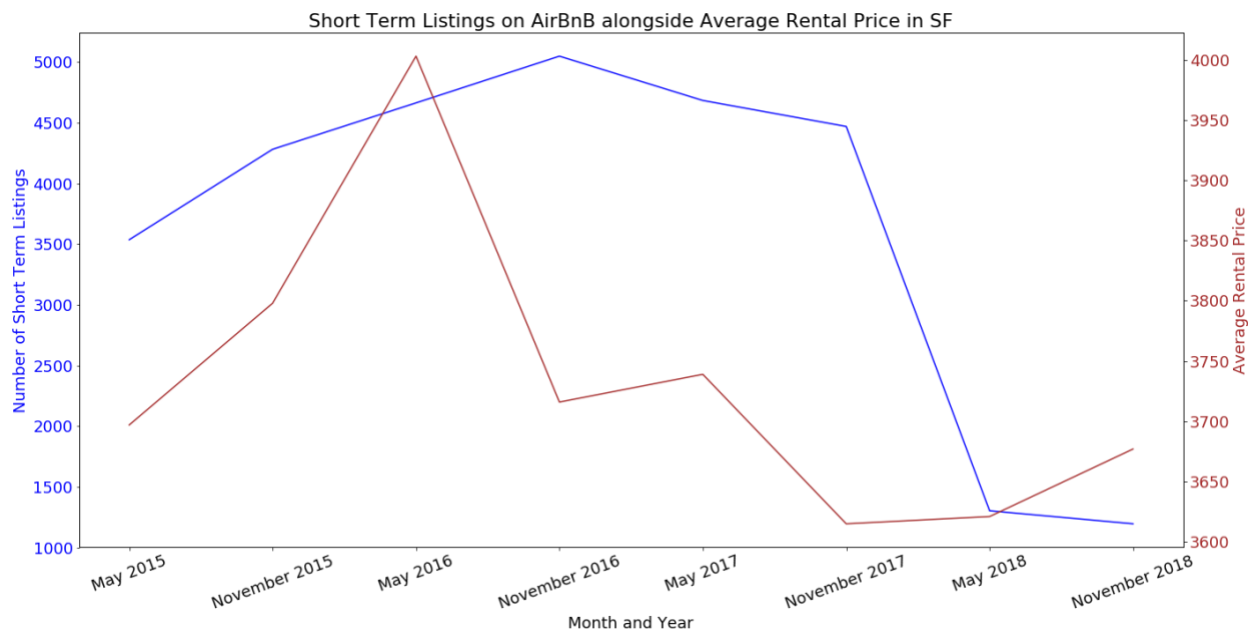
That aside, as for minimum night requirements, about 38.3% of the listings require a stay of specifically at least 30 nights. Not surprisingly, looking at the cumulative distribution function for minimum nights, 30 nights is the largest step. Despite that, is important to note that the majority of listings only require a minimum stay of less than 10 nights. 18.07%, 20.14%, and 11.13% of listings only require a minimum night stay of 1, 2, and 3 nights respectively. In total, 96.18% of listings have a value for their minimum nights requirement of 30 or less. As such, many of these listings seem to accommodate short-term rentals.



Next, it is worth looking into correlation between the minimum night requirement and the monthly price of a listing. Through a regression fitting the minimum nights to the monthly price in the data, it appears that there is a 2.58 dollar decrease in monthly price with every increase in minimum nights required. However, with a R^2 value of .11%, this estimate does not prove to be very significant at all again. The problem is likely in the fact that the values for the Airbnb listings minimum nights are not very continuous. As discussed earlier, a total of 96.18% of the listings have a minimum nights requirement value of 30 nights or less. Even if we try to fit the data for only listings with a minimum nights requirement value of 30 nights or less, the fact that large portions of data are centered around a few values—1, 2, 3, 7, and 30 nights—continues to reduce the accuracy of the model.

Recalling the claim that reduced supply in the long-term market increases prices in the long-term market, it is worth looking at how the number of short-term listings trends alongside the average price of a rental in San Francisco. This is explored by plotting the number of short-term listings for apartments on Airbnb against the average price for an apartment in San Francisco.

Theoretically, an increase in the number of short-term listings would pair along with an increase in the average price of a rental. From the plot, such a relationship does not seem too clear, although the values have trended in the same direction overall. Of course, the housing market is affected by numerous things like economic cycles.



From this analysis, it is clear that Airbnb has significant penetration in the housing market, with several properties up for rent in some of the city's most popular neighborhoods. It is important to note that while there does seem to be many listings that allow only short-term stays, the majority listings also have the proper license with the San Francisco government. That being said, even regulated short-term rentals still reduce the supply of properties in the long-term rental market. However, this seems to be an issue that the city of San Francisco needs to take initiative on, rather than Airbnb as a company.