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Class: Friedman - Datascy



Boston Airbnb Listings - Investment Recommendation for Real Estate Acquisition in the city of Boston - Massachusetts - USA



Background

- The main objective of this Project is to recommend 10 properties listed on Airbnb in Boston/MA to one of our clients.
- The investor believes that acquiring real estate in this region can be an intelligent way to diversify his assets.
- At the end of this project, valuable insights will be provided that will guide our client's real estate investment decisions.



Boston Overview

- Boston is the capital and largest city in the state of Massachusetts, and there are 23 neighborhoods in the city that is well known for its rich history, culture and education.
- Boston is known as the "City of Walking" due to its excellent pedestrian and walking infrastructure. The city has over 180 kilometers of sidewalks and walking trails.
- Boston has four well-defined seasons, with hot, humid summers and cold, snowy winters. Autumn is especially beautiful, with the leaves on the trees changing color and creating a spectacular backdrop.
- The city is home to many institutions of art and culture, including the Boston Museum of Fine Arts, the Isabella Stewart Gardner Museum and the Boston Symphony Orchestra.



Boston Overview

- Boston is also known for its cuisine, with famous dishes like clam chowder, lobster rolls and cannolis.
- The Boston Marathon is one of the most famous events in the city. The race takes place every year in April and is the oldest annual marathon in the world.
- Harvard University, one of the most prestigious institutions of higher education in the world, is located in Cambridge, a neighboring city of Boston.
- As Boston has 23 neighborhoods, it would be impossible to comment on each one of them in this overview, however, we will make a brief description of 04 neighborhoods that stood out during this project:



Boston Overview

- **Back Bay** is a neighborhood well known for its wide, symmetrical streets, Victorian architecture and historic buildings. Location of the famous Newbury Street, a shopping street with designer stores and restaurants, as well as the Prudential Center, an iconic skyscraper offering panoramic views of the city.
- **Beacon Hill** is a historic neighborhood known for its charming cobblestone streets, classically detailed buildings and old mansions. It is also home to the Massachusetts State House, the Massachusetts State Capitol.
- **South Boston** is a predominantly Irish neighborhood and has a rich history tied to the port and fishing industry. It is also famous for celebrating St. Patrick's Day.
- **South End** is a trendier neighborhood with a vibrant artist community, art galleries, theaters, restaurants and many stylish renovated residential buildings.



Data Source

- Initially, 3 datasets were used for this analysis, having been taken from the Inside Airbnb website.
- During the analysis, 2 more datasets were added, which are updates of the "listings.csv" dataset. During the project we will explain the reason for these updates.

1 - listings.csv: list of all properties in the period between 11/11/2008 and 09/06/2016 with 96 variables (columns) and 3,885 records (rows).

2 - calendar.csv: list of prices and availability of properties in the period between 09/06/2016 and 09/05/2017 with 6 variables (columns) and 68,275 records (rows).

3 - reviews.csv: list of reviews that users made about the experiences they had at the properties in the period between 03/21/2009 and 09/06/2016 with 4 variables (columns) and 1,308,890 records (rows).



Data Source

4 - **listings_updated.xlsx**: updated list of all properties after “data cleaning” in the period between 12/03/2008 and 08/21/2016 with 96 variables (columns) and 1,343 records (rows).

5 - **listings_43properties.xlsx**: list updated after “data cleaning” with the 43 most profitable Airbnb properties in the period between 03/19/2010 and 03/28/2016 with 96 variables (columns) and 43 records (rows).



1 - Exploratory analysis and data cleaning

Performing an exploratory analysis on the “listings.csv” dataset, four relevant factors were observed that directly impact data analysis right at the beginning of the project.

1.1 - Type of room (room_type):

The first factor to be taken into account refers to the type of room (room_type). As we are conducting an analysis for future recommendation to purchase properties in Boston, we will consider only “whole property” properties (Entire home/apt).

Therefore, properties with private rooms (private_room) where the property is shared with other people will be disregarded; and shared room properties (shared_room) in which both the room and the common areas of the property are shared with other people.



SQ

So, from now on, only the 2,127 considered “whole properties” (Entire home/apt) will be considered. In order to know the number of properties per type of room (room_type), SQL (Structured Query Language) was used, which is considered a programming language used to manage relational databases.

The platform used throughout this project to carry out queries and data manipulation was the Data.World Platform. Below is the SQL query used:

```
SELECT room_type,  
COUNT(room_type) AS quantity  
FROM listings  
WHERE room_type = 'Private room' OR  
room_type = 'Entire home/apt' OR  
room_type = 'Shared room'  
GROUP BY room_type
```

Query 1 - SQL

Below is a graphical representation of the number of properties per room type (room_type):

Room type	Quantity
Private room	1378
Entire home/apt	2127
Shared room	80
Total	3585

Table 1 - Quantity of property per room type (room_type)

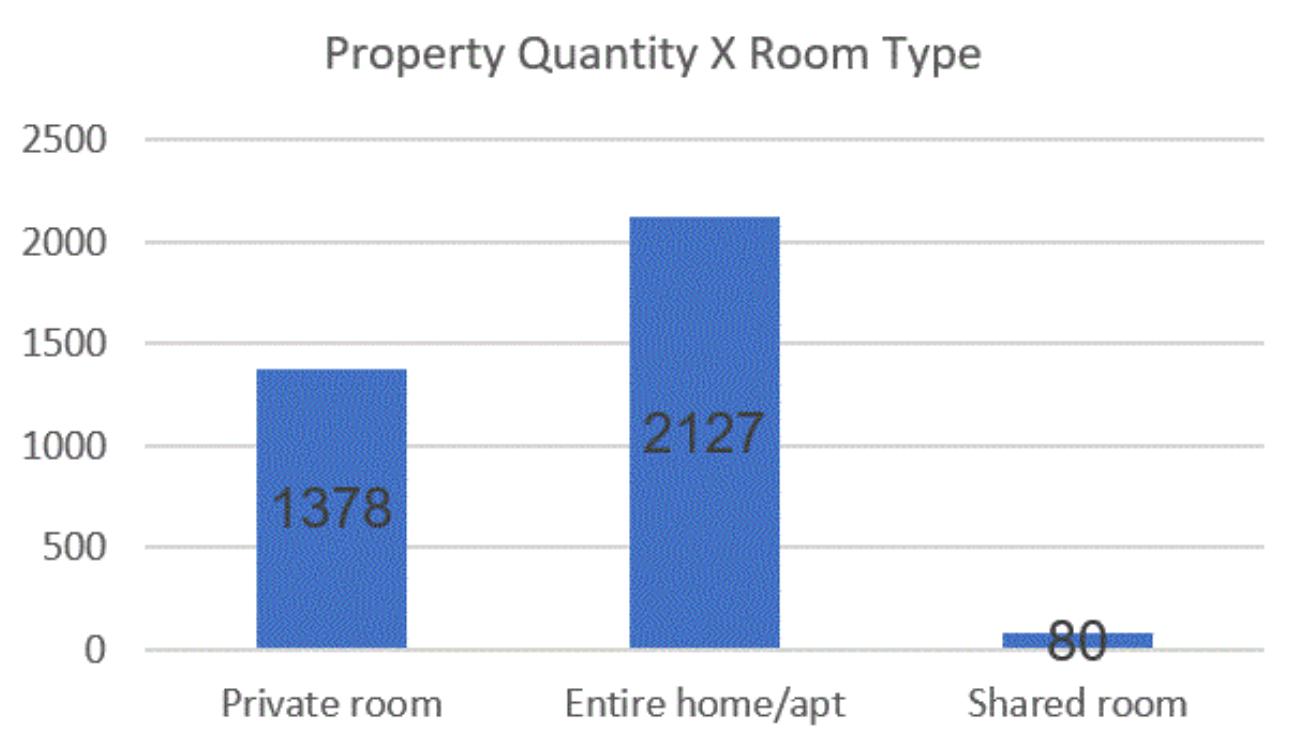


Chart 1 – quantity of property per room type (room_type)

1.2 - Availability of the property during the year (availability_365):

The second factor to be taken into account in this exploratory analysis refers to the availability of the property during the year. It was verified that the properties that were available “0 days in the year” ended up generating discrepancies in the general evaluation of the data.

This is because those properties with “availability_365” = 0 are actually not available for rent. In these cases, the host usually registers a property on Airbnb that he uses as a home, that is, the property remains in the system, but is not available for rent because the host regretted his decision and forgot to remove the property from the system.

A total of 367 properties (Entire home/apt) were identified as unavailable for rent in a period of 01 year. Therefore, these data will be considered “outliers” within this analysis and therefore will be excluded from the dataset. Values considered null (NULL) will also be excluded from the analysis of the availability of the property during the year.

Therefore, the number of properties (Entire home/apt) increased from 2,127 to 1,739 (properties). Below is the SQL query used:

```
SELECT *
FROM listings
WHERE room_type = 'Entire home/apt' AND
availability_365 <> 0 AND
availability_365 <> 0 IS NOT NULL;
```

Query 2- SQL

1.3 - Guest review score ranking (review_scores_rating):

In this exploratory analysis, a third important aspect to be considered concerns the classification of guest evaluation scores (review scores rating). This information is crucial for incorporating qualitative data into the property analysis, enabling us to provide the best possible recommendations for our client.

It was observed that there are several elements that contribute to the classification of the score of an evaluation, the main ones being:

- Accuracy of what was described and photographed in the advertisement compared to the reality found (review scores accuracy);
- Cleaning and hygiene of the property (review scores cleanliness);
- Quality and speed at check-in (review scores check-in);
- Communication between host and guest (review scores communication);
- Location of the property in the city (review scores location);
- Price of stay compared to experience offered (review scores value).

After analyzing the data, it was verified that properties with a review scores rating lower than 75% will negatively impact the final result of our analysis, given that we intend to recommend the 10 best properties in Boston for acquisition and investment.

Therefore, ratings lower than 75% will be disregarded from our dataset. Fields without data will be considered null values (NULL) and consequently the records (lines) will be excluded from the analysis. Therefore, the number of properties (Entire home/apt) increased from 1,739 to 1,356 (properties). Below is the SQL query used:

```
SELECT *
FROM listings
WHERE room_type = 'Entire home/apt' AND
availability_365 <> 0 AND
availability_365 <> 0 IS NOT NULL AND
review_scores_rating >= 75 AND
review_scores_rating IS NOT NULL;
```

Query 3 - SQL

1.4 - Property type (property_type):

The fourth factor to be taken into account in this exploratory analysis refers to the type of property. First, an analysis was performed using SQL to determine the types of properties and their respective quantities within the Airbnb listing. Below is the SQL query used:

```
SELECT property_type,  
COUNT(property_type) AS quantity  
FROM listings  
WHERE room_type = 'Entire home/apt' AND  
availability_365 <> 0 AND  
availability_365 <> 0 IS NOT NULL AND  
review_scores_rating >= 75 AND  
review_scores_rating IS NOT NULL AND  
property_type IS NOT NULL  
GROUP BY property_type  
ORDER BY quantity DESC;
```

Query 4 - SQL

With this analysis, we were able to arrive at the following compilation of data:

Property type	Quantity
Apartment	1110
House	105
Condominium	94
Loft	20
Townhouse	14
Boat	9
Bed & Breakfast	2
Guesthouse	1
Total	1355

Table 2 – number of properties by property type (property_type)

It is observed that the number of apartments predominates in the listing of Airbnb properties, followed by houses and properties in closed complexes (condominium).

Although lofts and townhouses are not representative in terms of quantity across the 1,355 properties analyzed, we decided to keep these data in the dataset. This will allow for further analysis to determine whether these properties are suitable for consideration as real estate investment options.

In this project, loft is understood as: a fully integrated property, in this way, with the exception of the bathroom, there are no walls that delimit the rooms. Finally, townhouse is understood as: a property with the same architectural façade as the other neighbors.

Given that the purpose of this project is to recommend the top 10 properties for acquisition and investment in Boston, it makes no sense to include the last three property types (Boat, Bed & Breakfast, Guesthouse) in our considerations.

The client is looking for land properties and therefore boats will be excluded from future reviews. The property type "Bed & Breakfast" resembles a hostel and is therefore outside the scope of this project and will also be disregarded from the analyses.

In addition, the "Guesthouse" property type implies a situation where the guest shares the house with the owners, which does not meet the criteria of this project and will also be disregarded in the analyses.

Therefore, these three types of properties will be considered “outliers” within this analysis and therefore will be excluded from the dataset. Below is the SQL query used to exclude “outliers” from our dataset:

```
SELECT *
FROM listings
WHERE room_type = 'Entire home/apt' AND
availability_365 <> 0 AND
availability_365 <> 0 IS NOT NULL AND
review_scores_rating >= 75 AND
review_scores_rating IS NOT NULL AND
property_type IS NOT NULL AND
property_type NOT IN('Boat', 'Bed & Breakfast', 'Guesthouse');
Query 5 - SQL
```

Four relevant factors were observed that directly influenced the exploratory analysis in the "listings.csv" dataset. To optimize future analyses, a “data cleaning” was performed and a new dataset called "listings_atualizado.xlsx" was created with the applied filters. With this, the SQL formulas will no longer need to be linked to "Formula 5 - SQL", which will make the codes cleaner in the future.

Therefore, from now on, the number of properties per property type (property_type) will be described as follows:

Property type	Quantity
Apartment	1110
House	105
Condominium	94
Loft	20
Townhouse	14
Total	1343

Table 3 - number of properties by property type - updated (property_type)

2 - Average daily price and average of reviews by type of property

Already using the new dataset (listings_atualizado.xlsx), now we intend to understand how the data regarding the average daily price and the average of the evaluations (reviews) by type of property behaves. For this analysis, we used the following SQL Query:

```
SELECT property_type, average_of_evaluations, average_price,  
quantity_property  
FROM  
    (SELECT property_type, ROUND(AVG(review_scores_rating)) AS  
average_of_evaluations,  
        ROUND(AVG(price)) AS average_price, COUNT(*) AS  
quantity_property  
    FROM listings_updated  
    GROUP BY property_type) as t1  
ORDER BY average_price DESC
```

Query 6 - SQL

With this analysis, we were able to arrive at the following compilation of data:

Property type	Average ratings	Average prices	Number of properties
House	95%	\$ 286	105
Townhouse	97%	\$ 268	14
Condominium	94%	\$ 241	94
Loft	96%	\$ 240	20
Apartment	93%	\$ 218	1110

Table 4 – Comparison between average price, average of valuations and quantity per property type

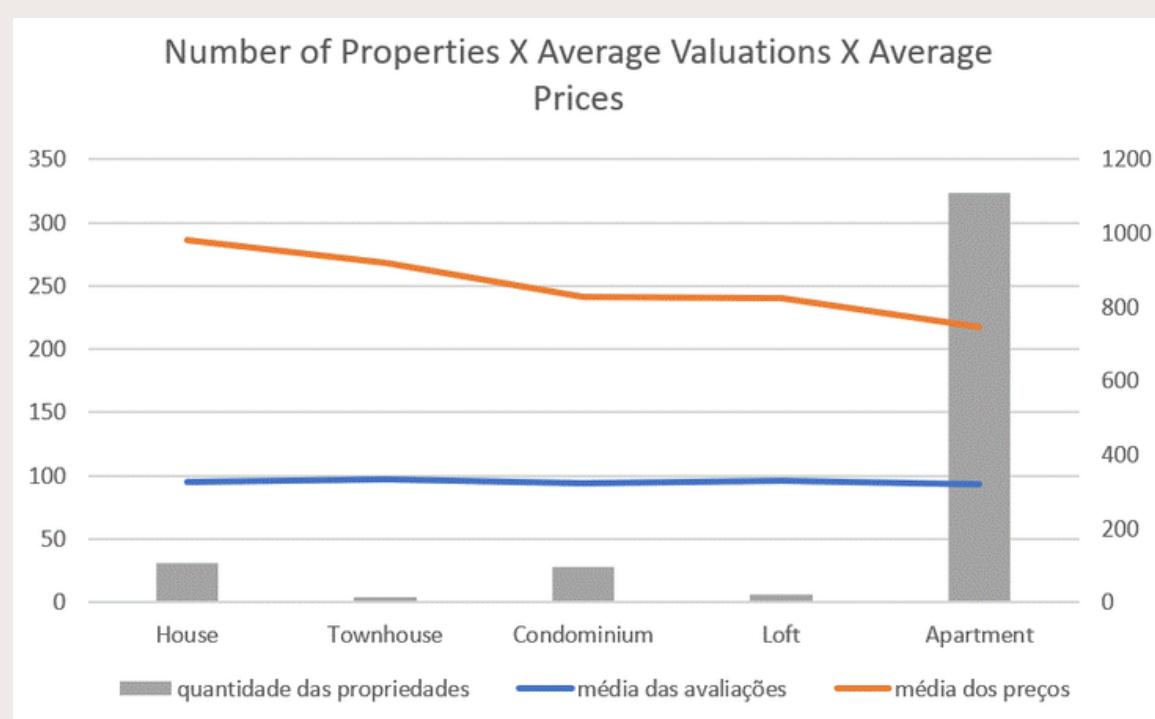


Chart 2 - quantity of property X average of appraisals X average price

Analyzing Table 4 together with Graph 2, we can see that the property types “house” and “townhouse” have the highest average stay prices. On the other hand, the “apartment” that has the largest number of properties available for booking, has the lowest average price and the lowest average of evaluations among the other types of properties.

The “townhouse” property type had the highest valuation among properties (97%) and has the second highest median price (\$268). This information appears to be promising, but should not be analyzed in isolation. Therefore, we will need to analyze other variables together to arrive at a conclusion that generates insights for our client.

Proportion of the type of property in relation to the total

■ Apartment ■ House ■ Condominium ■ Loft ■ Townhouse

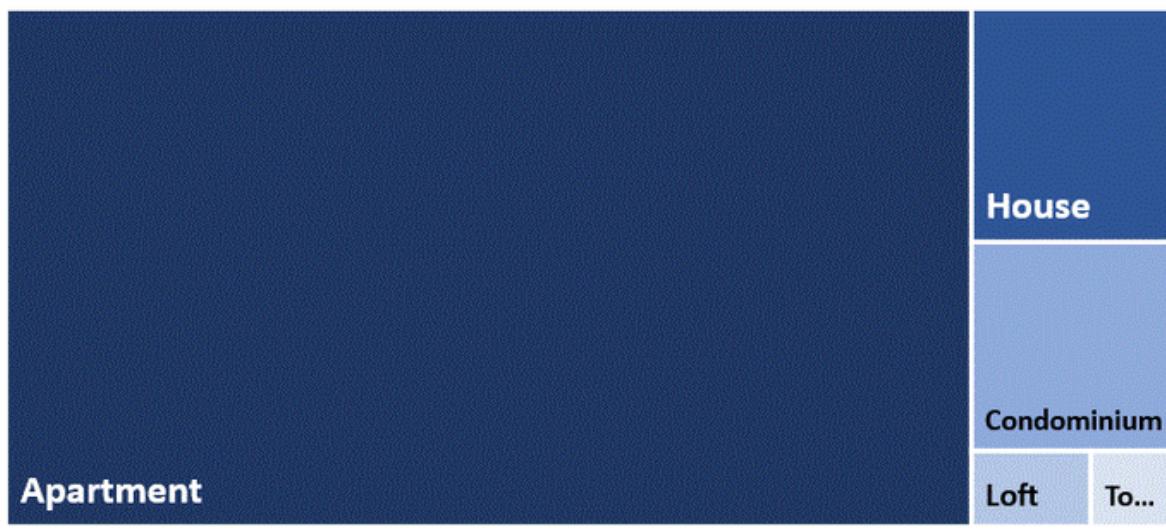


Chart 3 – Proportion of the type of property in relation to the total

It can be seen that apartments are the most listed type of property on Airbnb, representing 82.65% of the total. By considering this information, it is possible to infer that purchasing apartments in Boston can be a smart investment strategy, as it suggests a greater demand for this type of property from guests. However, it is important to take into account that this information cannot be considered conclusive on its own and must be analyzed in conjunction with other relevant factors.

3 - Seasonality

The period of greatest demand for rental bookings at Airbnb properties was between the months of September and October 2016, with 20,775 and 20,046 bookings respectively.

Bearing in mind that these data were analyzed after “data cleaning”, therefore, the reserves are smaller than the total reserves for the period found in the initial dataset. A series of filters were performed to improve the quality of the final insights.

As of November 2016, bookings began to drop considerably, with a 37% drop compared to the previous month. Reserves showed a growth reaction only from March 2017 onwards and then they proved to be relatively stable over the next few months until September 2017.

In the last month, reservations have plummeted dramatically, as the data is incomplete, as they only cover the first days of September 2017. Below is the SQL query used:

```
SELECT CONCAT(MONTH(c.date), ' - ', YEAR(c.date)) AS period,  
COUNT(*) AS total_bookings  
FROM calendar c  
JOIN listings_updated l  
ON c.listing_id = l.id  
WHERE c.available = 'false' AND  
neighbourhood IS NOT NULL  
GROUP BY YEAR(c.date), MONTH(c.date)  
ORDER BY c.date;
```

Query 7 - SQL

Period	Total bookings
sep/16	20.775
out/16	20.046
nov/16	12.651
dez/16	11.833
jan/17	10.758
fev/17	10.059
mar/17	14.077
apr/17	14.653
may/17	15.087
jun/17	13.914
jul/17	14.225
ago/17	13.934
sep/17	2.247

Table 5 - number of reservations compared to months

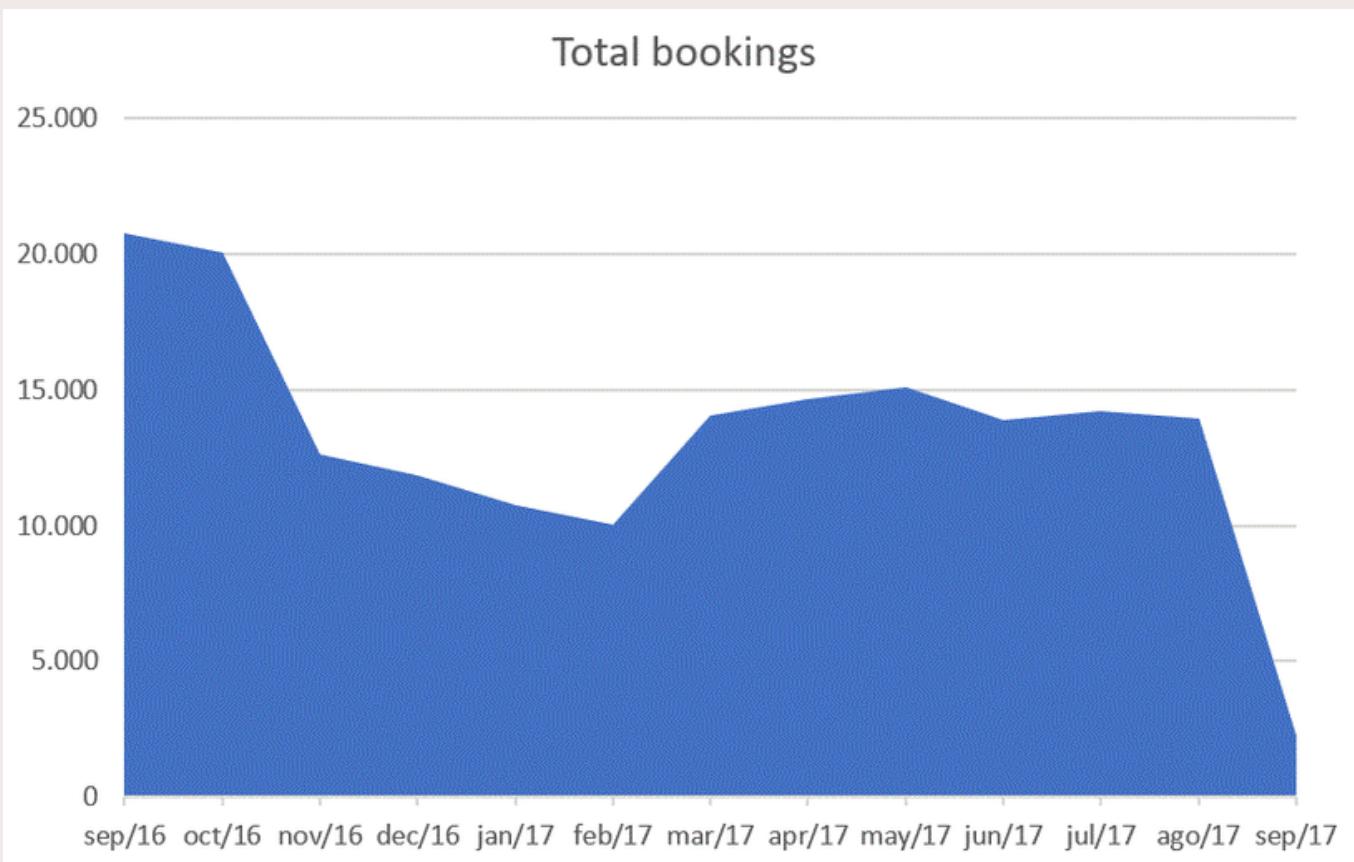


Chart 4 - number of reservations compared to months

A possible explanation for the high demand for rental bookings at Airbnb properties in September and October 2016 could be the occurrence of holidays such as Labor Day on 9/7/2016, Patriot Day on 9/11/2016 and Columbus Day on 10/12/2016, as well as the Head Of The Charles rowing event held on 19 and 20 October 2016.

Between November 2016 and February 2017, accommodation bookings were the worst, possibly due to winter in Boston, which is quite severe at this time of year.

An analysis was also carried out regarding the demand for reservations during the days of the week. Below is the SQL query used:

```
SELECT
CASE
WHEN day_of_week = 1 THEN "1-Sunday"
WHEN day_of_week = 2 THEN "2-Monday"
WHEN day_of_week = 3 THEN "3-Tuesday"
WHEN day_of_week = 4 THEN "4-Wednesday"
WHEN day_of_week = 5 THEN "5-Thursday"
WHEN day_of_week = 6 THEN "6-Friday"
WHEN day_of_week = 7 THEN "7-Saturday"
END AS day_of_week,
COUNT(*) AS total_bookings
FROM
(SELECT
l.id,
c.date,
YEAR(c.date),
MONTH(c.date),
DATE_PART("dayofweek",c.date) AS day_of_the_week,
c.available,
c.price
FROM calendar c
JOIN listings_updated l
ON c.listing_id=l.id
WHERE neighbourhood IS NOT NULL) t1
WHERE available = 'false'
GROUP BY day_of_week
ORDER BY day_of_week;
```

Query 8 - SQL

Day of the week	Total bookings
Sunday	24.406
Monday	25.202
Tuesday	24.688
Wednesday	25.110
Thursday	25.169
Friday	25.136
Saturday	24.548

Table 6 - number of reservations compared to days of the week

Total bookings X Weekdays

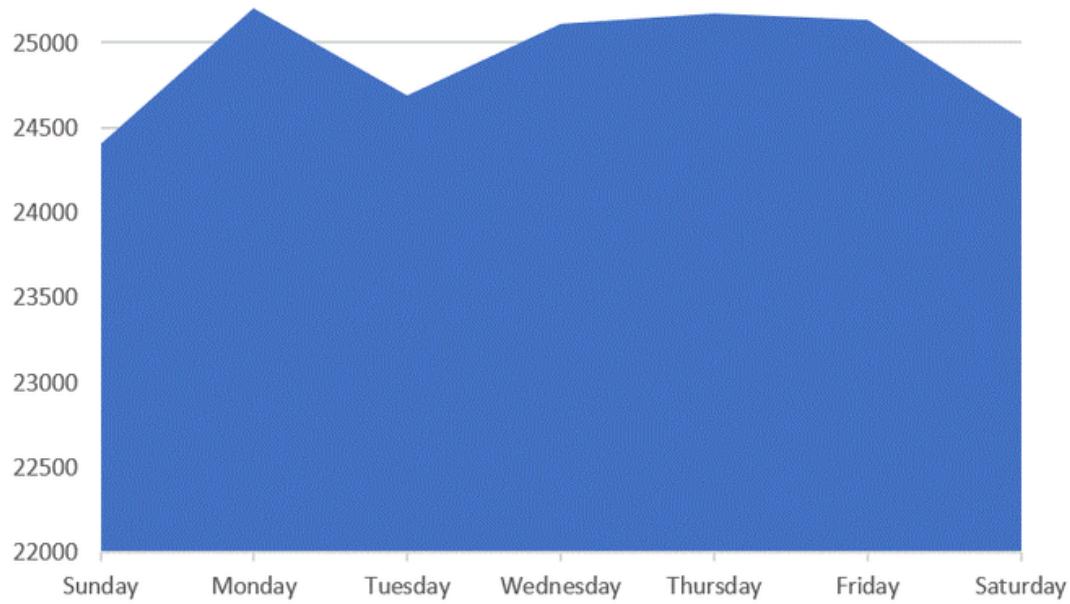


Chart 5 – number of reservations compared to days of the week

It was found that the days of the week with the highest movement of bookings are business days, with a significant increase in demand on Mondays, a decrease on Tuesdays and a relatively stable demand during the other days of the week., until it starts to fall on weekends.

This factor is probably related to the fact that Boston is a city with a strong economy and many business opportunities. Boston is a university city and has a concentration of companies and organizations in sectors such as technology, biotechnology, health, finance, among others. In addition, Boston has a large port, which makes the city an important center for international trade.

Boston is also a hub for innovation and entrepreneurship, with many startups and emerging business incubators. The city is home to established universities, such as Harvard and MIT, for example, which help to attract talent and resources to the region. Additionally, Boston has a comprehensive public transportation system and is strategically located, making it an attractive choice for companies looking to expand their presence in the northeastern region of the United States.

In summary, Boston is a dynamic and diverse city with a strong economy and many business opportunities in a variety of sectors. Probably, due to these factors, the days of the week with the highest movement of accommodation reservations are business days.

4 - Location and Occupancy Rate

For initial investment analyses, it may be a smart strategy to select areas with a large number of properties listed on Airbnb, as this may indicate greater guest demand and a greater flow of people in that region. Below is an SQL Query that can be used to identify the number of properties and the average price for each neighborhood in Boston:

```
SELECT neighbourhood,  
COUNT(id) AS number_of_properties,  
ROUND(AVG(price)) AS average_booking_price  
FROM listings_updated  
WHERE neighbourhood IS NOT NULL  
GROUP BY neighbourhood  
ORDER BY number_of_properties DESC;
```

Query 9 - SQL

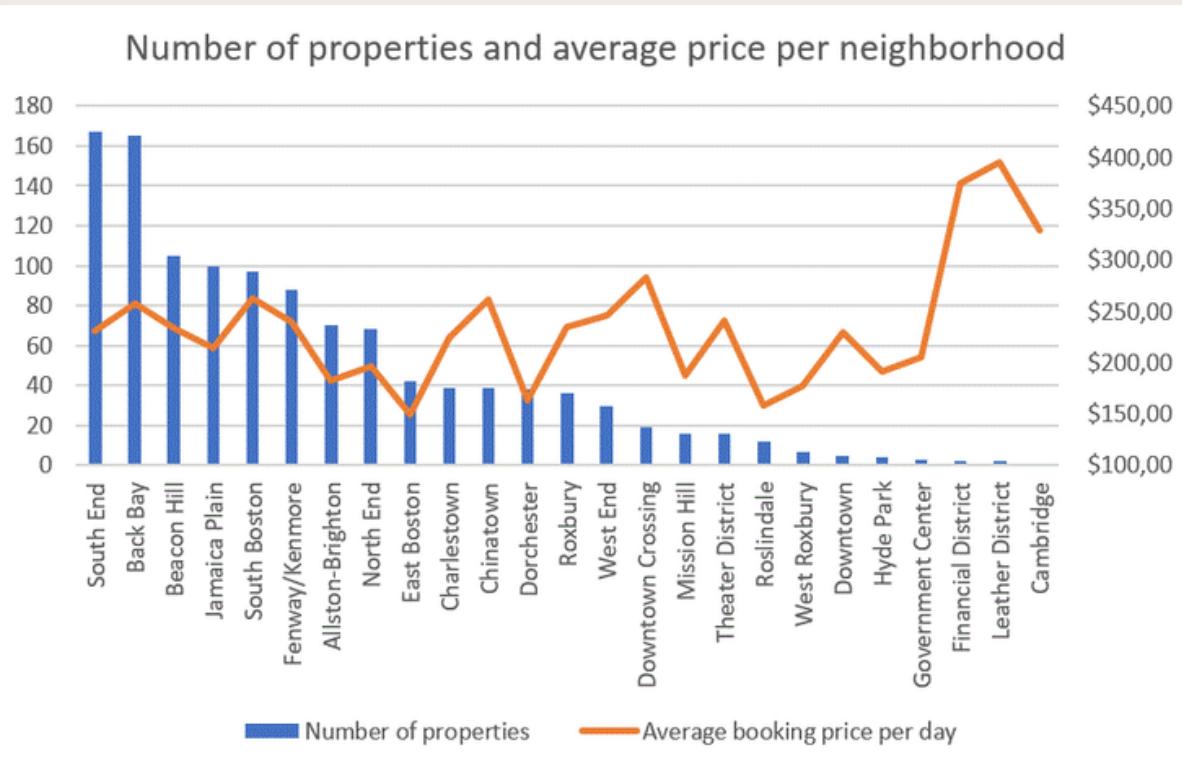


Chart 6 – number of properties and average price in each neighborhood

Neighborhoods	Number of properties	Average daily price
1 - South End	167	\$231,00
2 - Back Bay	165	\$257,00
3 - Beacon Hill	105	\$234,00
4 - Jamaica Plain	100	\$214,00
5 - South Boston	97	\$263,00

Table 7 – Top 5 neighborhoods with the largest number of properties and their respective average prices for accommodation

It is interesting to note that the neighborhoods with the highest number of properties also have an average reservation price per day that varies between \$214.00 and \$263.00, which can be considered a very competitive value for daily rates.

Another important factor that we must take into account in this project is the occupancy rate of the properties during the period of 01 year. In order to analyze the occupancy rate of properties segmented by neighborhood, we will use the following SQL query:

```

SELECT
l.neighbourhood,
COUNT(*) AS total_bookings,
COUNT(DISTINCT(l.id)) AS number_of_properties,
(ROUND(365 - AVG(l.availability_365)))/365 AS occupancy_rate
FROM listings_updated l
JOIN calendar c
ON l.id = c.listing_id
WHERE c.available = 'false' AND
c.date >= '2016-09-06' AND
c.date < '2017-09-05' AND
l.neighbourhood IS NOT NULL
GROUP BY l.neighbourhood
ORDER BY number_of_properties DESC;

```

Query 10 - SQL

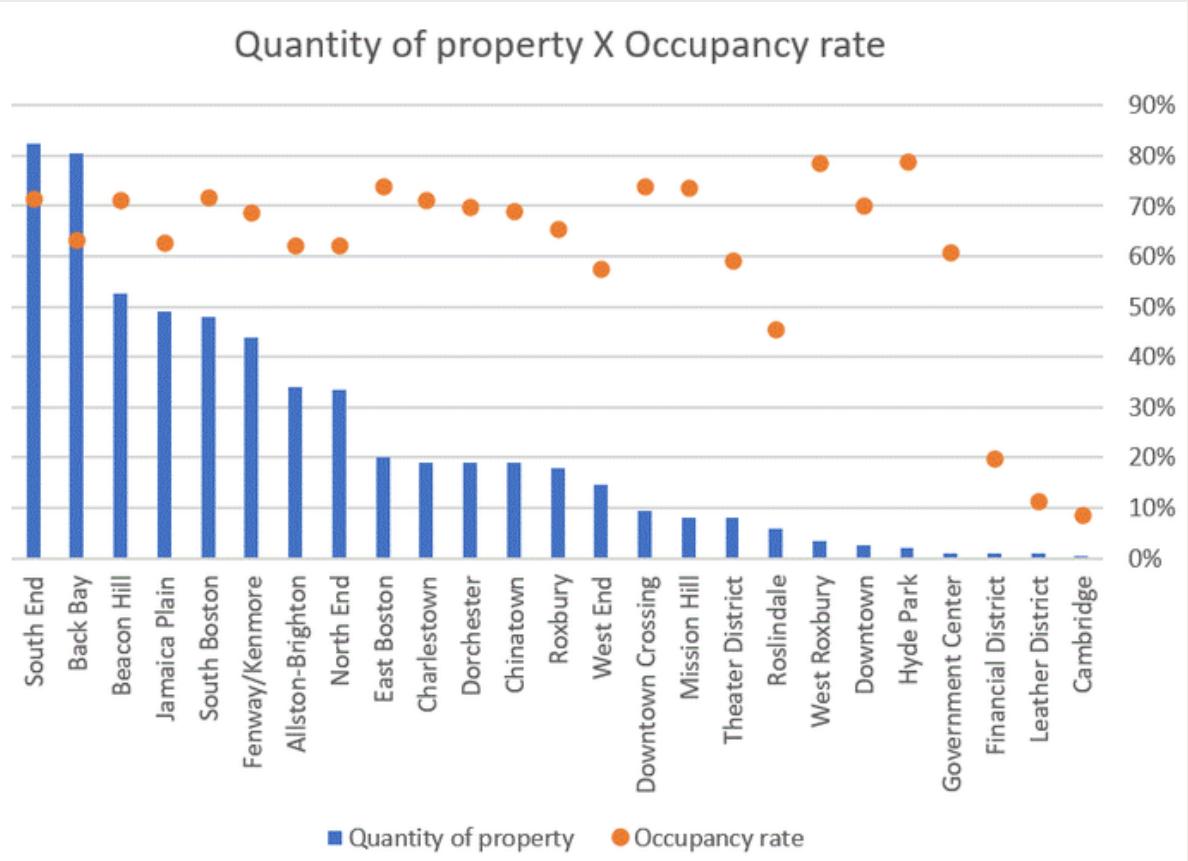


Chart 7 – number of properties in each neighborhood and their respective occupancy rates

Neighborhoods	Number of properties	Average occupancy rate
1 - South End	167	71,51%
2 - Back Bay	165	63,29%
3 - Beacon Hill	105	71,23%
4 - Jamaica Plain	100	62,74%
5 - South Boston	97	71,78%

Table 8 – Top 5 neighborhoods with the highest number of properties in each neighborhood and their respective occupancy rates

Analyzing Table 8, we can see that among the Top 5 neighborhoods with the highest number of properties, three neighborhoods stand out. South End is the neighborhood that has the most properties (167), has an average nightly price of over two hundred dollars (\$231.00) and has an average occupancy rate of over seventy percent (71.51%) .

Beacon Hill is another neighborhood that stands out from the rest, as it is a region that has more than 100 properties listed on Airbnb (105), has an average daily price of more than two hundred dollars (\$257.00) and has an average occupancy rate above seventy percent (71.23%).

South Boston is another neighborhood that stands out from the rest, as it is among the five neighborhoods with the highest number of properties listed on Airbnb (97), has the highest average daily price among the TOP 5 neighborhoods with the highest number of properties (\$263.00) and has an average occupancy rate of over seventy percent (71.78%).

South Boston is another neighborhood that stands out from the rest, as it is among the five neighborhoods with the highest number of properties listed on Airbnb (97), has the highest average daily price among the TOP 5 neighborhoods with the highest number of properties (\$263.00) and has an average occupancy rate of over seventy percent (71.78%).

We still need to delve deeper into the data analysis, but these three neighborhoods are proving to be great regions for acquiring investment properties. On the other hand, neighborhoods such as the Financial District, Leather District and Cambridge, should be completely excluded from the final property investment recommendations, given that these 3 neighborhoods have less than 3 properties listed on Airbnb, in addition to having a lower occupancy rate than than 20% in the year.

5 - Average Sales of Properties by Neighborhood

An important financial index is to determine what is the average income of the neighborhoods per property in the period of 01 year. To determine this average, we will use the following SQL Query:

```

SELECT l.neighbourhood,
SUM(c.price) AS revenue,
COUNT(DISTINCT(l.id)) AS number_of_properties,
AVG(c.price) AS average_rev_property_per_night,
SUM(c.price)/COUNT(DISTINCT(l.id)) AS average_totalrev_property
FROM listings_updated l
JOIN calendar c
ON l.id=c.listing_id
WHERE l.neighbourhood IS NOT NULL AND
available = 'false'
GROUP BY neighbourhood
ORDER BY average_totalrev_property DESC;

```

Query 11 - SQL

Average revenue of neighborhoods per property

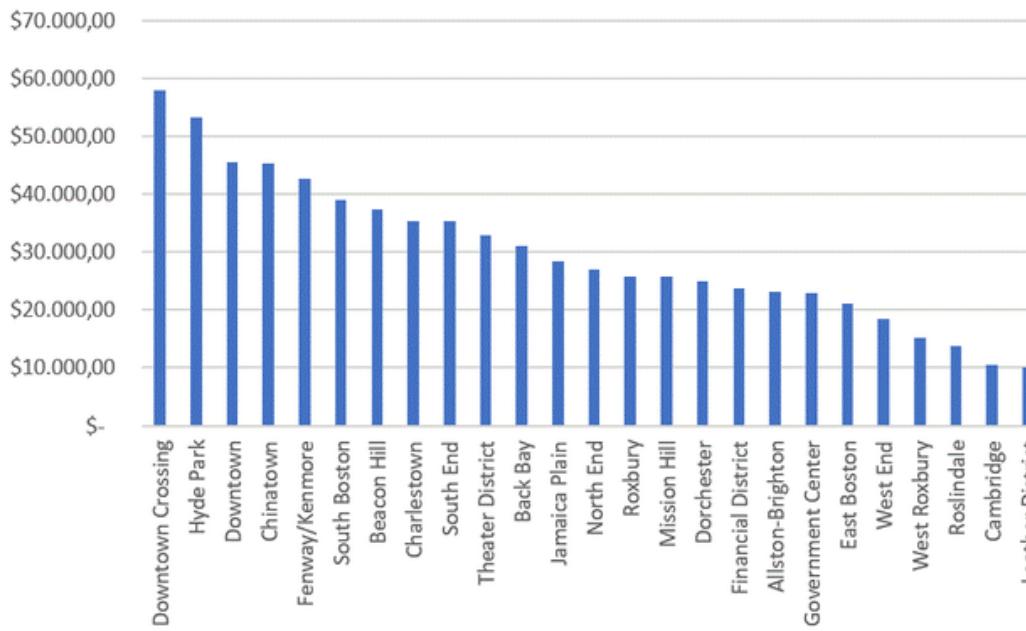


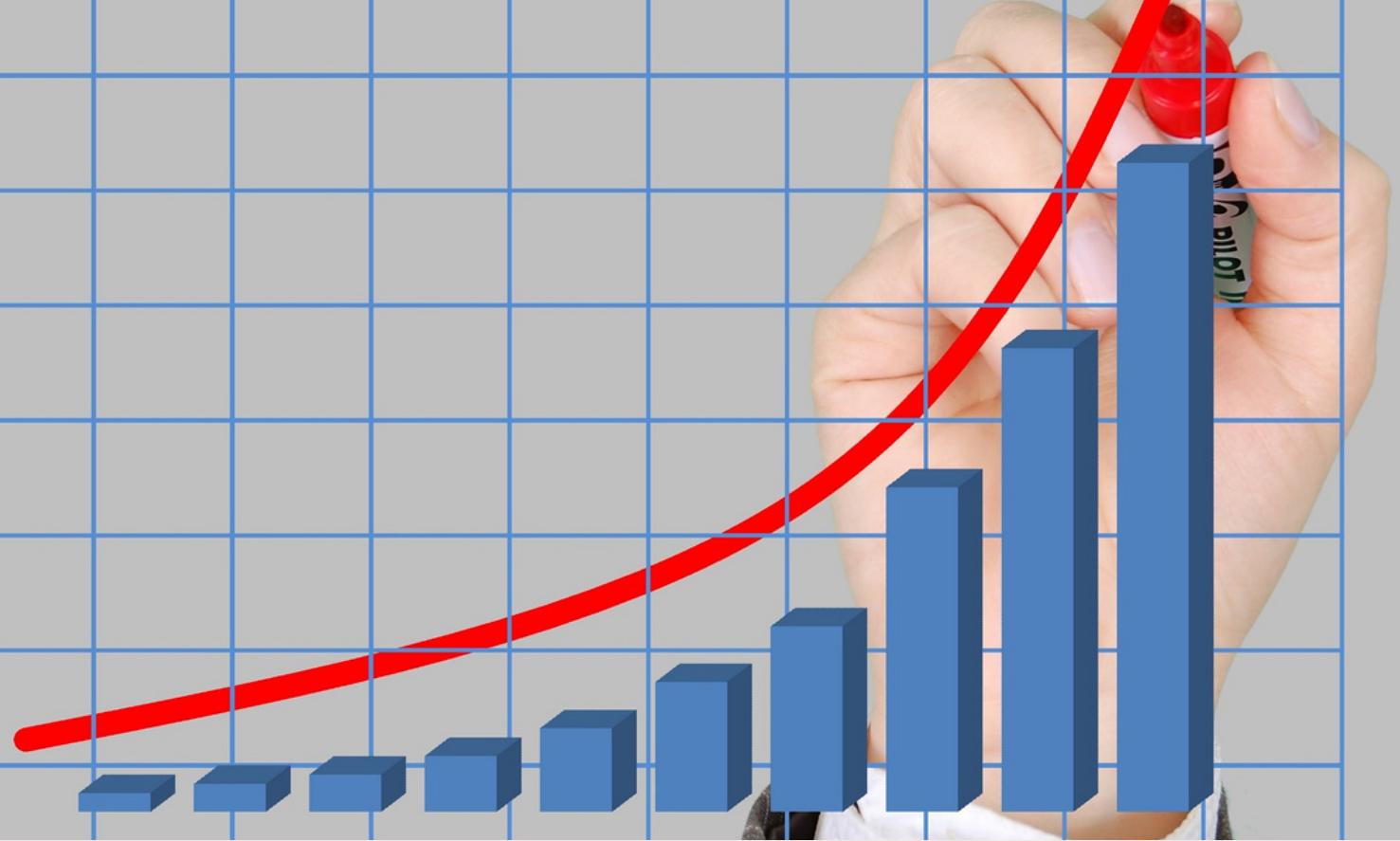
Chart 8 – average income of neighborhoods per property

Still focusing our efforts to analyze the three neighborhoods that stood out in the Top 5 neighborhoods with the highest number of properties per neighborhood, we will see below the average total revenue per property in the neighborhoods of South End, Beacon Hill and South Boston.

Neighborhoods	Number of properties	Average revenue of neighborhoods per property	Occupancy rate
South End	165	\$35.258,06	71,51%
Beacon Hill	105	\$37.451,60	71,23%
South Boston	96	\$38.948,51	71,78%

Table 9 - Neighborhoods with the largest number of properties and their respective occupancy rates and average revenue

These three neighborhoods, in addition to being among the five neighborhoods with the highest number of properties, are among the nine neighborhoods with the highest average revenue per property in the 01-year period, in addition to having an occupancy rate greater than 70%.



In order to narrow down the data to obtain relevant insights, let's identify which are the most profitable properties on the Airbnb listing. For this, we will use a SQL Query that merges the datasets "listings_atualizado.xlsx" and "calendar.csv" to obtain the number of reservations made in each property in the period between 09/06/2016 and 09/05/2017 and calculate the profit by multiplying bookings by the room rate.

```
SELECT c.listing_id,
neighbourhood,
l.price,
SUM(l.price) AS revenue,
(ROUND(365 - AVG(availability_365))*100)/365 AS occupancy_rate
FROM calendar c
JOIN listings_updated l
ON l.id=c.listing_id
WHERE available= 'false'
GROUP BY c.listing_id, l.availability_365, neighbourhood, l.price
ORDER BY revenue DESC
LIMIT 43;
```

Query 12 - SQL

After analyzing the data, we could see that out of all the properties listed, 43 properties had annual revenue greater than \$100k. This is a great performance, so in order to analyze which are the best investment properties, we will narrow our listing down to these 43 properties.

To optimize data handling and future analysis, a new dataset was created with these 43 properties, called "listings_43properties".

6 - Characteristics of the Properties

Using this new dataset, we will perform a SQL Query to be able to identify which types of properties stand out in front of these 43 most profitable properties.

```
SELECT property_type, COUNT(*) AS quantity  
FROM listings_43properties  
GROUP BY property_type  
ORDER BY quantity DESC;  
Query 13 - SQL
```

Property type	Quantity
Apartment	29
Condominium	7
House	5
Townhouse	1
Loft	1

Table 10 – Number of residences by type of property among the 43 most profitable properties

Proportion of the property type in relation to the total

■ Apartment ■ Condominium ■ House ■ Townhouse ■ Loft

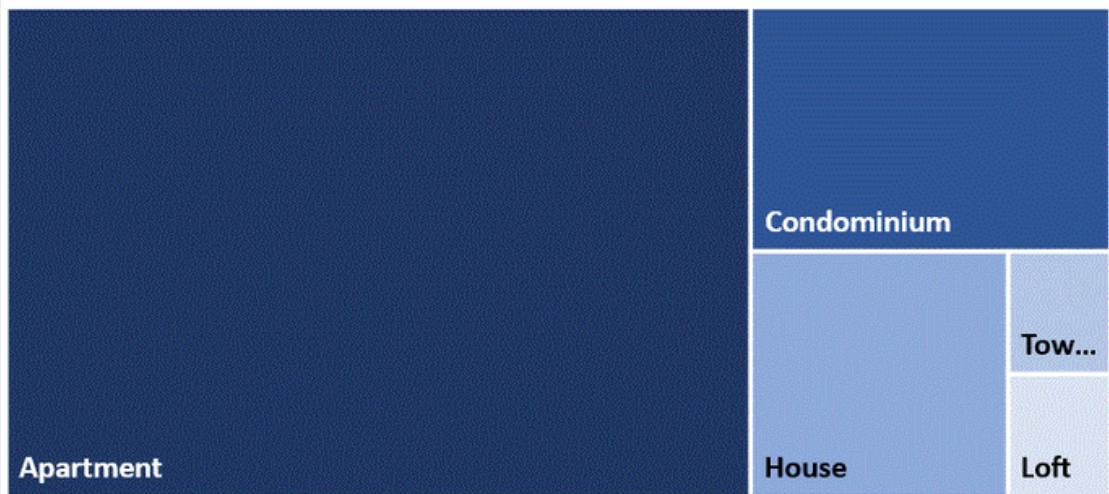


Chart 9 – Proportion of the type of property in relation to the total

It is noted that, even among the 43 most profitable properties on Boston Airbnb, the apartment remains the predominant type of property (67.44%). Although the proportion of apartments has decreased by 15.41% from the initial quantity listed in the project (82.65%), it is still the dominant property type.

This information reinforces the strategy that it might be wise to consider buying apartments listed on Airbnb, as it suggests greater demand from guests.

Another interesting factor that could be analyzed is that of the 43 properties with income greater than one hundred thousand dollars per year, only 7 properties have a swimming pool (16%), and, of these properties, only one of them is among the 10 most profitable properties on the list. from Airbnb.

Therefore, a swimming pool is not a determining criterion for the valuation of a property's income. Of these 7 properties with a pool, 4 are located in Chinatown. All 7 properties with pools have occupancy rates greater than 74% and nightly rates over \$299.

Now, we will perform a SQL Query to analyze how these 43 properties are distributed among Boston neighborhoods.

```
SELECT neighbourhood, COUNT(*) AS quantity  
FROM listings_43properties  
GROUP BY neighbourhood  
ORDER BY quantity DESC;  
Query 14 - SQL
```

Number of properties in each neighborhood

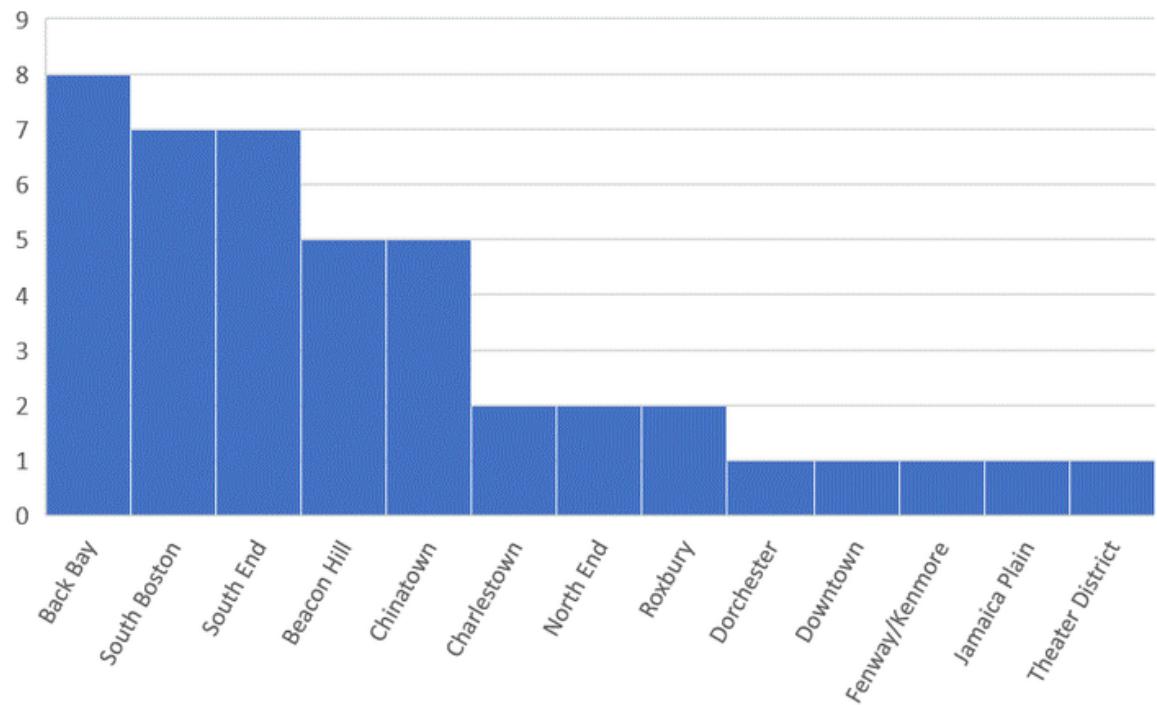


Chart 10 – number of properties in relation to the number of bathrooms

Analyzing this chart, we can see that the three neighborhoods that stand out among the Top 5 neighborhoods with the highest amounts of properties per neighborhood, also stand out among the 4 neighborhoods with the most profitable properties in the Airbnb listing.

During the analysis of these neighborhoods, we were able to identify that South End, Beacon Hill and South Boston, in addition to having an average occupancy rate greater than 70%, are still among the neighborhoods with the highest number of properties that generate more than \$100,000 in revenue. per annum.

The Back Bay neighborhood is among the Top 5 neighborhoods with the highest number of properties per neighborhood, but it did not stand out among the other neighborhoods, as it has an average occupancy rate of less than 63.29%.

However, when we look at the properties in Back Bay in the list of the 43 most profitable properties in the Airbnb listing, we can see that all 4 properties have an occupancy rate greater than 87%.

Another interesting factor is that Back Bay is the neighborhood with the highest number of most profitable properties on the Airbnb listing, that is, properties that generate more than \$100,000 in revenue per year. Therefore, we will add Back Bay among the best neighborhoods to invest in property.

Therefore, this information only confirms that Back Bay, South End, Beacon Hill and South Boston are the best neighborhoods to acquire investment properties.

7 - Choice of Properties

In order to achieve our goal of recommending 10 Boston properties to buy for our client to invest in real estate, it is crucial that our analysis is as realistic as possible.

For example, in the list of the 43 most profitable properties in the Airbnb listing, that is, properties that generate revenue greater than \$100,000 per year, two properties are included where the daily rate is \$1,200 and \$1,000.

These values are well above the average that people in Boston are usually willing to pay, since the average daily price in a property (Entire home/apt) is \$ 226 according to the query in the dataset "listings_atualizado.xlsx"

Therefore, for this analysis to be more consistent with the reality of the region, for greater efficiency in the results, we will restrict the listing of these 43 most profitable properties.

We will only consider properties with room rates less than \$400 and an occupancy rate greater than 80%. After this filter, 24 properties remained among the most profitable.

Among the top 24 properties with nightly rates under \$400 and an occupancy rate greater than 80%, 16 properties are part of the Back Bay, South End, Beacon Hill and South Boston neighborhoods, considered the best neighborhoods for real estate acquisition with a focus on investment.

The most interesting thing is that these properties are evenly distributed in this new listing, as each of these four neighborhoods has 4 properties, among the most profitable properties.

Property ID	Neighborhood	Price per night	Occupancy rate	Anual revenue
48612	Back Bay	\$375,00	87,67%	\$ 120.000,00
1868513	Back Bay	\$298,00	98,63%	\$ 107.280,00
4044840	Back Bay	\$298,00	98,63%	\$ 107.280,00
4516065	Back Bay	\$298,00	98,63%	\$ 107.280,00
9248612	Beacon Hill	\$350,00	98,63%	\$ 126.000,00
5959251	Beacon Hill	\$375,00	81,92%	\$ 112.125,00
8782592	Beacon Hill	\$300,00	95,07%	\$ 104.100,00
5743939	Beacon Hill	\$324,00	86,30%	\$ 102.060,00
2384107	South Boston	\$350,00	98,63%	\$ 126.000,00
14843783	South Boston	\$349,00	98,63%	\$ 125.640,00
11563716	South Boston	\$389,00	80,27%	\$ 113.977,00
9626428	South Boston	\$280,00	99,18%	\$ 101.360,00
7634365	South End	\$329,00	97,81%	\$ 117.453,00
12094488	South End	\$350,00	89,04%	\$ 113.750,00
7114655	South End	\$300,00	95,34%	\$ 104.400,00
7954808	South End	\$299,00	91,78%	\$ 100.165,00

Table 11 – The 16 most profitable properties located in the best neighborhoods for real estate investment

Out of the 43 most profitable properties on the Boston Airbnb listing, we were able to narrow it down to 24 properties by adopting criteria such as: properties with room rates less than \$400 and an occupancy rate greater than 80%.

After doing that, we discovered that of these 24 properties, 16 are located in the best neighborhoods for investment-focused property acquisition.

As the objective of this project is to recommend 10 properties to a client, we will disregard the analysis of the other properties and focus only on these 16 properties located in the Back Bay, South End, Beacon Hill and South Boston neighborhoods.

8 - Analysis of the Number of Bathrooms and Bedrooms

Among the 16 selected properties, we will now analyze the number of properties in relation to the number of bathrooms. Following SQL Query:

```
SELECT bathrooms, COUNT(*) AS quantity
FROM listings_43properties
WHERE id IN(7634365, 12094488, 7114655, 7954808,
2384107, 14843783, 11563716, 9626428, 9248612,
5959251, 8782592, 5743939, 48612, 1868513, 4044840, 4516065)
GROUP BY bathrooms
ORDER BY quantity DESC;
Query 15 - SQL
```

Number of properties in relation to the number of bathrooms

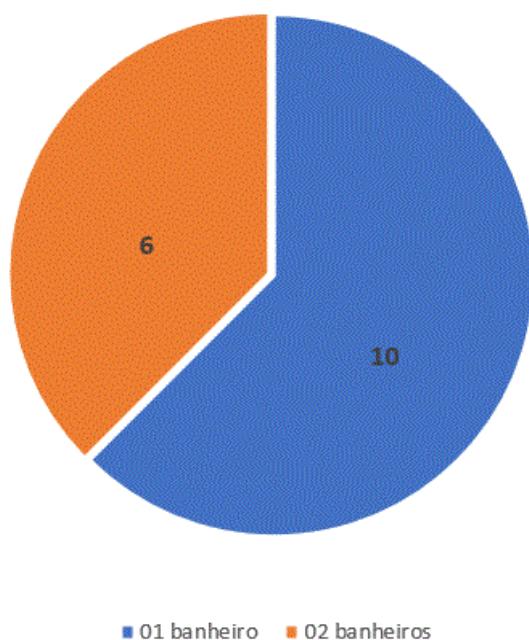


Chart 11 – number of properties in relation to the number of bathrooms

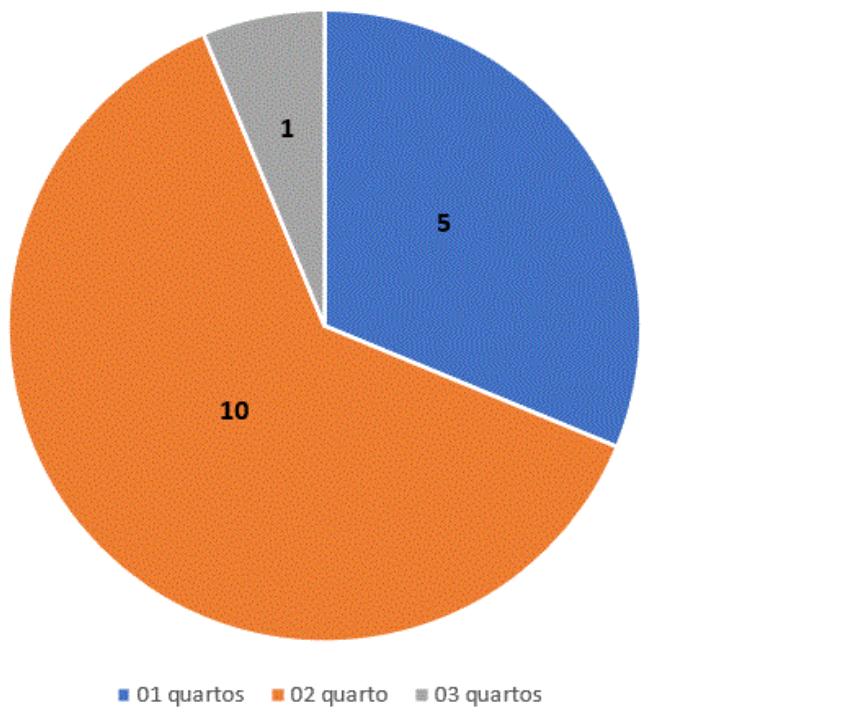
Based on the data analyzed, we can say that the 16 properties in question have only one or two bathrooms. Furthermore, we can infer that most of them (62.5%) have only one bathroom, while the rest (37.5%) have two bathrooms.

The same analysis will be carried out in relation to the number of rooms. Among the 16 selected properties, we will analyze the number of properties in relation to the number of rooms. Following SQL Query:

```
SELECT bedrooms, COUNT(*) AS quantity
FROM listings_43properties
WHERE id IN(7634365, 12094488, 7114655, 7954808,
2384107, 14843783, 11563716, 9626428, 9248612,
5959251, 8782592, 5743939, 48612, 1868513, 4044840, 4516065)
GROUP BY bedrooms
ORDER BY quantity DESC;
```

Query 16 - SQL

Number of properties in relation to the number of bedrooms



Graph 12 – number of properties in relation to the number of rooms

Based on the data analyzed, we can say that the 16 properties in question have only one, two or three bedrooms. Furthermore, we can conclude that most of them (62.5%) have two bathrooms.

Digging deeper into the data to try to find any trends, we blended the number of bathrooms with the number of bedrooms to see which pattern stood out.

Results follow: 5 properties with one bathroom and one bedroom were identified; 5 properties with one bathroom and two bedrooms; no property with two bathrooms and one bedroom; 5 properties with two bathrooms and two bedrooms; and 1 property with two bathrooms and three bedrooms.

As the number of properties remained constant and there was no peak trend, we were unable to conclude which type of property is ideal, just by analyzing the number of bathrooms and bedrooms.

9 - Analysis of the Quantity and Types of Properties

Now, let's find out which types of properties stand out among the 16 properties analyzed. To obtain this information, we will make the following SQL query:

```
SELECT property_type, COUNT(*) AS quantity
FROM listings_43properties
WHERE id IN(7634365, 12094488, 7114655, 7954808,
2384107, 14843783, 11563716, 9626428, 9248612,
5959251, 8782592, 5743939, 48612, 1868513, 4044840, 4516065)
GROUP BY property_type
ORDER BY quantity DESC;
```

Query 17 - SQL

Number of properties in relation to
the type of property

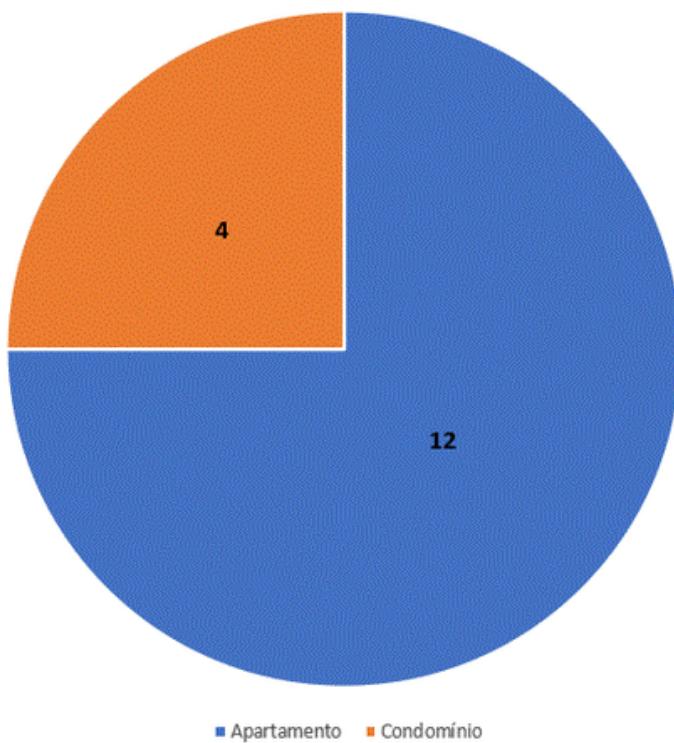


Chart 13 - type and quantity of properties

Through the information obtained, we can conclude that 12 of the 16 properties analyzed are apartments, that is, 75%. The other properties are of the condominium type. Therefore, the most profitable properties on the Airbnb listing in the city of Boston are mostly apartments with one or two bathrooms, and with one or two bedrooms.

10 - Review of the Best Hosts

Now, we will do an analysis to understand the Top Hosts profile. This information will help us generate valuable insights for our client as he is interested in investing in the real estate market with the intention of possibly becoming a successful Top Host.

The first information we will look for is related to the Top 5 Hosts with the highest revenues. Here we will only consider the properties (Entire home/apt) of the dataset “listings_updated.xls”. Following SQL Query:

```
SELECT l.host_id,  
l.host_name,  
SUM(l.price) AS revenue,  
COUNT(DISTINCT(l.id)) AS number_of_properties,  
AVG(l.price) AS average_rev_property_per_night  
FROM listings_updated l  
JOIN calendar c  
ON l.id=c.listing_id  
WHERE l.neighbourhood IS NOT NULL AND  
host_id IS NOT NULL AND  
available= 'false'  
GROUP BY host_id, l.host_name  
ORDER BY revenue DESC  
LIMIT 5;
```

Query 18 - SQL

Host_id	Host name	Anual revenue	Number of properties	Average price per night
9419684	Mike	\$ 2.618.351,00	31	\$ 324,37
30283594	Kara	\$ 1.900.670,00	42	\$ 229,00
12243051	Flatbook	\$ 1.811.861,00	26	\$ 224,82
20857768	Adam	\$ 766.020,00	10	\$ 258,27
48494513	Inn Boston	\$ 437.506,00	9	\$ 248,02

Table 12 – Top 5 hosts with the highest revenues in the Airbnb listing - properties (Entire home/apt)

For comparison purposes, we will now analyze the Top 5 Hosts from the 43 properties with the highest revenues. In this case, the SQL Query will be performed using the “listings_43properties.xlsx” dataset.

```
SELECT l.host_id,  
l.host_name,  
SUM(l.price) AS revenue,  
COUNT(DISTINCT(l.id)) AS number_of_properties,  
AVG(l.price) AS average_rev_property_per_night  
FROM listings_43properties l  
JOIN calendar c  
ON l.id=c.listing_id  
WHERE l.neighbourhood IS NOT NULL AND  
host_id IS NOT NULL AND  
available= 'false'  
GROUP BY host_id, l.host_name  
ORDER BY revenue DESC  
LIMIT 5;
```

Query 19 - SQL

Host_id	Host name	Anual revenue	Number of properties	Average price per night
9419684	Mike	\$ 1.179.950,00	10	\$ 393,97
41998307	Erica	\$ 378.750,00	1	\$ 1.250,00
32079650	Danielle	\$ 351.000,00	1	\$ 1.000,00
10502779	Peter	\$ 233.475,00	1	\$ 849,00
12243051	Flatbook	\$ 217.618,00	2	\$ 314,48

Tabela 13 – Top 5 Hosts das 43 propriedades com as maiores receitas

Out of the 43 most profitable properties on the Boston Airbnb listing, we were able to narrow it down to 24 properties by adopting criteria such as: properties with room rates less than \$400 and an occupancy rate greater than 80%.

After completing this step, we found that of the 24 properties, 16 are located in the most attractive neighborhoods for real estate investment: Back Bay, South End, Beacon Hill and South Boston. In order to identify the five main owners of these 16 properties, we will make an SQL query using the dataset "listings_43properties.xlsx".

```

SELECT l.host_id,
l.host_name,
SUM(l.price) AS revenue,
COUNT(DISTINCT(l.id)) AS number_of_properties,
AVG(l.price) AS average_rev_property_per_night
FROM listings_43properties l
JOIN calendar c
ON l.id=c.listing_id
WHERE available= 'false' AND
id IN(7634365, 12094488, 7114655, 7954808, 2384107,
14843783, 11563716, 9626428, 9248612, 5959251,
8782592, 5743939, 48612, 1868513, 4044840, 4516065)
GROUP BY host_id, l.host_name
ORDER BY revenue DESC
LIMIT 5;

```

Query 20 - SQL

Host_id	Host name	Anual revenue	Number of properties	Average price per night
9419684	Mike	\$ 435.817,00	4	\$ 317,42
12243051	Flatbook	\$ 217.618,00	2	\$ 314,48
4004495	Max	\$ 126.000,00	1	\$ 350,00
47990609	Carmela	\$ 126.000,00	1	\$ 350,00
3715298	Alex	\$ 125.640,00	1	\$ 349,00

Table 14 – Top 5 Hosts from the 43 properties with the highest revenues

Analyzing these 03 tables together, we can see that two hosts stand out among the rest. Mike and Flatbook appear in the Top 5 hosts in the three different SQL queries performed, with Mike having the highest revenue among hosts in all queries performed.

Host_id	Host name	Number of properties	Anual revenue	Predominant type of property	Neighborhood with more properties
9419684	Mike	31	\$2.618.351,00	Apartamento	Fenway/Kenmore
12243051	Flatbook	26	\$1.811.861,00	Apartamento	South End

Table 15 – Comparison between the two hosts that stood out

As these hosts are successful owners, carrying out a benchmarking and identifying their main characteristics can be an intelligent strategy so that we can make assertive recommendations to our client.

Therefore, based on the information obtained from this data analysis, we recommend that our client try to have an annual revenue with the rental of properties around \$2,215,106 (average between the revenue of the two analyzed hosts); has around 29 properties (average); seek to acquire mostly apartments; and try to acquire properties in the Fenway/Kenmore and South End neighborhoods.

However, in relation to neighborhoods, this recommendation is not mandatory, given that we have already identified that the best neighborhoods for acquiring investment properties in Boston are: Back Bay, South End, Beacon Hill and South Boston.

However, this information should not be analyzed in isolation, as a factor that directly impacts financial indicators is the acquisition price of the property.

The purchase price of the property has a profound impact on Annual Cost, Annual Net Income, Break Even and Return on Investment (ROI). However, all these indicators will be analyzed in detail in the next chapter on Financial Forecast.

11 - Financial Forecast

In this financial projection, we will carry out all the necessary calculations to later be able to calculate the main financial indicators: Total Annual Cost, Total Initial Cost, Annual Net Income, Breakeven Point and Return on Investment (ROI). The indicators of the 16 listed properties will be calculated.

The purchase costs of 3% on the purchase price indicated in Table 17, refer to costs with documentation, contract, legal fees, among others. The purchase brokerage fee of 6% on the acquisition price refers to the price that will be paid to the real estate agency that is carrying out this feasibility project for the acquisition of properties. At the end of this project, the 10 properties with the best performances will be selected.

There are two possibilities for the future acquisition of the properties. The first option would be to make a purchase proposal for the owners, based on the average acquisition price, since this feasibility project provides us with reliable information about these properties.

Some owners may agree to the offer to purchase, but if they don't, we still have a second option. We will collect all relevant data from selected properties and look for properties with similar quantitative and qualitative characteristics in the city of Boston.

An interesting suggestion would be to try to acquire properties in the same building or condominium as the 10 selected properties, since, generally, the architectural design, size and appraised value of the properties are relatively similar.

After we finish the economic feasibility study and choose the 10 most profitable properties, an interesting strategy would be to rent all 10 properties for one night to get as much qualitative information as possible about the properties.

ID	Address	Neighborhood	Average Property Acquisition Price
14843783	A Street, Boston, MA 02210, United States,	South Boston	\$ 1.700.000,00
12094488	Union Park Street, Boston, MA 02118, United States,	South End	\$ 858.000,00
11563716	Seaport Boulevard, Boston, MA 02210, United States,	South Boston	\$ 2.000.000,00
9626428	K Street, Boston, MA 02127, United States,	South Boston	\$ 961.625,00
9248612	Goodwin Place, Boston, MA 02114, United States,	Beacon Hill	\$ 865.000,00
8782592	West Cedar Street, Boston, MA 02108, United States,	Beacon Hill	\$ 1.400.000,00
7954808	Harrison Avenue, Boston, MA 02118, United States,	South End	\$ 1.865.000,00
7634365	Harrison Avenue, Boston, MA 02118, United States,	South End	\$ 1.612.250,00
7114655	East Berkeley Street, Boston, MA 02118, United States,	South End	\$ 807.375,00
5959251	Beacon Street, Boston, MA 02108, United States,	Beacon Hill	\$ 616.937,50
5743939	Cambridge Street, Boston, MA 02114, United States,	Beacon Hill	\$ 884.875,00
4516065	Garrison Street, Boston, MA 02116, United States,	Back Bay	\$ 684.562,50
4044840	Garrison Street, Boston, MA 02116, United States,	Back Bay	\$ 817.000,00
2384107	A Street, Boston, MA 02210, United States,	South Boston	\$ 1.063.500,00
1868513	Garrison Street, Boston, MA 02116, United States,	Back Bay	\$ 684.562,50
48612	Follen St, Boston, MA 02116, United States,	Back Bay	\$ 825.500,00

Table 16 - Average acquisition price of properties

The Average Property Acquisition Price was obtained through the use of zillow.com. By providing information such as address, city, zip code, number of bedrooms and bathrooms, as well as the type of property, the site provides us with real data on the sale value of properties in the Boston area.

A survey was conducted of the 16 properties, and actual sales values were collected. Then, to calculate the average of sales values, eight properties with the same characteristics were selected for each property.

The Average Property Acquisition Price will be essential information for us to calculate a series of expenses and costs related to the acquisition and maintenance of the property, such as taxes, insurance, financing fees, maintenance, among others.

Having an accurate estimate of the average acquisition price can help you make informed financial decisions and plan ahead to avoid unexpected financial surprises.

In Table 17 we will calculate the Value of Purchase Costs. This indicator will be calculated as follows: Average Property Acquisition Price * (Purchase Costs + Purchase Brokerage Fee). Therefore, we only need to multiply the property value by 9% to find the Purchase Cost Value.

ID	Average Property Acquisition Price	Purchase Costs	Purchase Brokerage Fee	Value of Purchase Costs
14843783	\$ 1.700.000,00	3%	6%	\$153.000
12094488	\$ 858.000,00	3%	6%	\$77.220
11563716	\$ 2.000.000,00	3%	6%	\$180.000
9626428	\$ 961.625,00	3%	6%	\$86.546
9248612	\$ 865.000,00	3%	6%	\$77.850
8782592	\$ 1.400.000,00	3%	6%	\$126.000
7954808	\$ 1.865.000,00	3%	6%	\$167.850
7634365	\$ 1.612.250,00	3%	6%	\$145.103
7114655	\$ 807.375,00	3%	6%	\$72.664
5959251	\$ 616.937,50	3%	6%	\$55.524
5743939	\$ 884.875,00	3%	6%	\$79.639
4516065	\$ 684.562,50	3%	6%	\$61.611
4044840	\$ 817.000,00	3%	6%	\$73.530
2384107	\$ 1.063.500,00	3%	6%	\$95.715
1868513	\$ 684.562,50	3%	6%	\$61.611
48612	\$ 825.500,00	3%	6%	\$74.295

Table 17 - Value of purchase costs

As our client chose to make a down payment of 30% of the property's value and will finance the other 70% of the value, every year he will have to pay 4.5% of financing interest. This interest will be charged when we are calculating the 70% residual value installments.

In the City of Boston, there is a mandatory annual property tax payable to the city at 1.20% of the property value.

There is no mandatory property insurance in Boston, Massachusetts. However, it is highly recommended that homeowners take out property insurance to protect their assets against damage and loss. This annual insurance costs an average of 0.24% of the property value.

ID	Average Property Acquisition Price	Interest per Year in Financing	Annual Tax	Annual Insurance (0.24%)
14843783	\$ 1.700.000,00	4,50%	1,20%	\$4.080,00
12094488	\$ 858.000,00	4,50%	1,20%	\$2.059,20
11563716	\$ 2.000.000,00	4,50%	1,20%	\$4.800,00
9626428	\$ 961.625,00	4,50%	1,20%	\$2.307,90
9248612	\$ 865.000,00	4,50%	1,20%	\$2.076,00
8782592	\$ 1.400.000,00	4,50%	1,20%	\$3.360,00
7954808	\$ 1.865.000,00	4,50%	1,20%	\$4.476,00
7634365	\$ 1.612.250,00	4,50%	1,20%	\$3.869,40
7114655	\$ 807.375,00	4,50%	1,20%	\$1.937,70
5959251	\$ 616.937,50	4,50%	1,20%	\$1.480,65
5743939	\$ 884.875,00	4,50%	1,20%	\$2.123,70
4516065	\$ 684.562,50	4,50%	1,20%	\$1.642,95
4044840	\$ 817.000,00	4,50%	1,20%	\$1.960,80
2384107	\$ 1.063.500,00	4,50%	1,20%	\$2.552,40
1868513	\$ 684.562,50	4,50%	1,20%	\$1.642,95
48612	\$ 825.500,00	4,50%	1,20%	\$1.981,20

Table 18 - Value of purchase costs

ID	Average Property Acquisition Price	30% deposit	Residual 70%	Residual portion of 70% (30 years)
14843783	\$ 1.700.000,00	\$510.000,00	\$1.190.000,00	\$7.768,06
12094488	\$ 858.000,00	\$257.400,00	\$600.600,00	\$3.920,58
11563716	\$ 2.000.000,00	\$600.000,00	\$1.400.000,00	\$9.138,89
9626428	\$ 961.625,00	\$288.487,50	\$673.137,50	\$4.394,09
9248612	\$ 865.000,00	\$259.500,00	\$605.500,00	\$3.952,57
8782592	\$ 1.400.000,00	\$420.000,00	\$980.000,00	\$6.397,22
7954808	\$ 1.865.000,00	\$559.500,00	\$1.305.500,00	\$8.522,01
7634365	\$ 1.612.250,00	\$483.675,00	\$1.128.575,00	\$7.367,09
7114655	\$ 807.375,00	\$242.212,50	\$565.162,50	\$3.689,26
5959251	\$ 616.937,50	\$185.081,25	\$431.856,25	\$2.819,06
5743939	\$ 884.875,00	\$265.462,50	\$619.412,50	\$4.043,39
4516065	\$ 684.562,50	\$205.368,75	\$479.193,75	\$3.128,07
4044840	\$ 817.000,00	\$245.100,00	\$571.900,00	\$3.733,24
2384107	\$ 1.063.500,00	\$319.050,00	\$744.450,00	\$4.859,60
1868513	\$ 684.562,50	\$205.368,75	\$479.193,75	\$3.128,07
48612	\$ 825.500,00	\$247.650,00	\$577.850,00	\$3.772,08

Table 19 - Deposit of 30% x residual 70% x portion of the residual of 70% in 30 years

To calculate the 30% Deposit simply multiply the purchase price by 30%. The 70% Residual can be calculated by subtracting the purchase price from the 30% deposit.

To calculate the installments of the 70% residual value over a period of 30 years, simply perform the following calculation: Residual 70% / (12 months * 30 years) + (Residual 70% * Interest per year on the Financing) / 12 months.

ID	Average Property Acquisition Price	Annual Tax	Cost to Furnish
14843783	\$ 1.700.000,00	\$20.400,00	\$51.000,00
12094488	\$ 858.000,00	\$10.296,00	\$25.740,00
11563716	\$ 2.000.000,00	\$24.000,00	\$60.000,00
9626428	\$ 961.625,00	\$11.539,50	\$28.848,75
9248612	\$ 865.000,00	\$10.380,00	\$25.950,00
8782592	\$ 1.400.000,00	\$16.800,00	\$42.000,00
7954808	\$ 1.865.000,00	\$22.380,00	\$55.950,00
7634365	\$ 1.612.250,00	\$19.347,00	\$48.367,50
7114655	\$ 807.375,00	\$9.688,50	\$24.221,25
5959251	\$ 616.937,50	\$7.403,25	\$18.508,13
5743939	\$ 884.875,00	\$10.618,50	\$26.546,25
4516065	\$ 684.562,50	\$8.214,75	\$20.536,88
4044840	\$ 817.000,00	\$9.804,00	\$24.510,00
2384107	\$ 1.063.500,00	\$12.762,00	\$31.905,00
1868513	\$ 684.562,50	\$8.214,75	\$20.536,88
48612	\$ 825.500,00	\$9.906,00	\$24.765,00

Table 20 - Annual Tax x Costs to furnish

To calculate the Annual Tax just multiply the Purchase Price by the 1.2% Annual Tax. The cost to furnish a property in Boston is around 3% of the property's value. So just multiply them.

ID	Average Property Acquisition Price	Maintenance Fee	Management Fee
14843783	\$1.700.000	\$ 5.000,00	\$ 25.128,00
12094488	\$858.000	\$ 4.000,00	\$ 22.750,00
11563716	\$2.000.000	\$ 6.000,00	\$ 22.795,40
9626428	\$961.625	\$ 4.200,00	\$ 20.272,00
9248612	\$865.000	\$ 4.000,00	\$ 25.200,00
8782592	\$1.400.000	\$ 5.000,00	\$ 20.820,00
7954808	\$1.865.000	\$ 5.200,00	\$ 20.033,00
7634365	\$1.612.250	\$ 5.100,00	\$ 23.490,60
7114655	\$807.375	\$ 4.200,00	\$ 20.880,00
5959251	\$616.938	\$ 3.500,00	\$ 22.425,00
5743939	\$884.875	\$ 4.000,00	\$ 20.412,00
4516065	\$684.563	\$ 3.700,00	\$ 21.456,00
4044840	\$817.000	\$ 4.300,00	\$ 21.456,00
2384107	\$1.063.500	\$ 4.400,00	\$ 25.200,00
1868513	\$684.563	\$ 3.700,00	\$ 21.456,00
48612	\$825.500	\$ 4.000,00	\$ 24.000,00

Table 21 - Maintenance fee x Management fee

The maintenance fee on a property is a fee paid by property owners to cover costs associated with maintaining and repairing the property and its common areas. The fee is usually charged in condominiums and apartment buildings, and the amount varies by location.

The maintenance fee can be used to cover common expenses such as cleaning, landscaping, maintenance of elevators and security systems, structural repairs, painting, replacement of wear and tear items, among others.

The value of the maintenance fee is determined by the extent of services and common areas that the owner uses. Regarding these 16 analyzed properties, the value of the maintenance fee was calculated taking into account the value of the properties.

The management fee on a property is a fee paid by property owners to cover costs associated with property management, such as rent management, rent collection, accounting, financial reporting and other services related to property management.

The management fee is charged by property management companies, which are hired by property owners to manage and care for their properties. For the 16 properties in this project, the management fee will be 20% of the Projected Annual Revenue, that is, the annual rental revenue.

ID	Maximum occupants	Average Property Acquisition Price	Airbnb fee	Electricity
14843783	5	\$1.700.000	\$5.025,60	\$2.196,00
12094488	2	\$858.000	\$4.550,00	\$878,40
11563716	6	\$2.000.000	\$4.559,08	\$2.635,20
9626428	4	\$961.625	\$4.054,40	\$1.756,80
9248612	6	\$865.000	\$5.040,00	\$2.635,20
8782592	4	\$1.400.000	\$4.164,00	\$1.756,80
7954808	4	\$1.865.000	\$4.006,60	\$1.756,80
7634365	4	\$1.612.250	\$4.698,12	\$1.756,80
7114655	5	\$807.375	\$4.176,00	\$2.196,00
5959251	2	\$616.938	\$4.485,00	\$878,40
5743939	6	\$884.875	\$4.082,40	\$2.635,20
4516065	3	\$684.563	\$4.291,20	\$1.317,60
4044840	3	\$817.000	\$4.291,20	\$1.317,60
2384107	3	\$1.063.500	\$5.040,00	\$1.317,60
1868513	3	\$684.563	\$4.291,20	\$1.317,60
48612	5	\$825.500	\$4.800,00	\$2.196,00

Table 22 – Airbnb fee x Cost of electricity

Airbnb charges City of Boston owners a 4% service fee of the reservation amount, including the cleaning fee. Therefore, to find out the Airbnb rate for each property, just perform the following calculation: Annual Revenue * 4%.

Regarding the cost of electricity, an estimate was made, taking into account the average price of electricity in Boston and the maximum number of occupants indicated in each property. The maximum number of occupants is described in the variable (accommodates) of the dataset “listings_43properties.xlsx”.

According to the Massachusetts Department of Public Utilities website, the average price of residential electricity in Boston in 2016 and 2017 was about \$0.20 per kilowatt-hour (kWh). As the occupancy rate of the 16 properties is greater than 80%, this estimate is quite realistic.

According to the same department, the average electrical energy expenditure of a person in Boston would be around 183 kWh per month. Therefore, to calculate the annual electricity bill, we will perform the following calculation: Maximum occupants * 183 kWh * \$0.20 per kilowatt-hour (kWh) * 12 months.

ID	Average Property Acquisition Price	Annual cost	Monthly cost
14843783	\$1.700.000	\$61.830	\$5.152
12094488	\$858.000	\$44.534	\$3.711
11563716	\$2.000.000	\$64.790	\$5.399
9626428	\$961.625	\$44.131	\$3.678
9248612	\$865.000	\$49.331	\$4.111
8782592	\$1.400.000	\$51.901	\$4.325
7954808	\$1.865.000	\$57.852	\$4.821
7634365	\$1.612.250	\$58.262	\$4.855
7114655	\$807.375	\$43.078	\$3.590
5959251	\$616.938	\$40.172	\$3.348
5743939	\$884.875	\$43.872	\$3.656
4516065	\$684.563	\$40.623	\$3.385
4044840	\$817.000	\$43.130	\$3.594
2384107	\$1.063.500	\$51.272	\$4.273
1868513	\$684.563	\$40.623	\$3.385
48612	\$825.500	\$46.883	\$3.907

Table 23 - Annual cost x Monthly cost

According to the same department, the average electrical energy expenditure of a person in Boston would be around 183 kWh per month. Therefore, to calculate the annual electricity bill, we will perform the following calculation: Maximum occupants * 183 kWh * \$0.20 per kilowatt-hour (kWh) * 12 months.

Now, to determine what the Annual Cost is, just add up all the fees and costs described above: Annual Tax + Annual Insurance + Annual Maintenance Fee + Annual Management Fee + Annual Airbnb Fee + Annual Electricity Cost. To calculate the Monthly Cost, simply divide the Annual Cost by month.

Remembering that this Annual Cost is not yet the Total Annual Cost, because in the next chapter when we calculate the Total Annual Cost, we will still need to add other variables. We will show this calculation in more detail in the next chapter.

12 - Calculation of the Main Financial Indicators

In this chapter, we will calculate the main financial indicators that will be used as a guide in making a decision to recommend our client to purchase the 10 most profitable properties on the Airbnb listing in the city of Boston. Below are the indicators to be calculated: Total Annual Cost, Total Initial Cost, Annual Net Income, Break Even Point and Return on Investment (ROI).

ID	Address	Number of bedrooms	Total Annual Cost
14843783	A Street, Boston, MA 02210, United States,	2	\$115.380
12094488	Union Park Street, Boston, MA 02118, United States,	2	\$71.561
11563716	Seaport Boulevard, Boston, MA 02210, United States,	3	\$127.790
9626428	K Street, Boston, MA 02127, United States,	2	\$74.422
9248612	Goodwin Place, Boston, MA 02114, United States,	2	\$76.579
8782592	West Cedar Street, Boston, MA 02108, United States,	2	\$96.001
7954808	Harrison Avenue, Boston, MA 02118, United States,	2	\$116.600
7634365	Harrison Avenue, Boston, MA 02118, United States,	2	\$109.048
7114655	East Berkeley Street, Boston, MA 02118, United States,	2	\$68.511
5959251	Beacon Street, Boston, MA 02108, United States,	1	\$59.606
5743939	Cambridge Street, Boston, MA 02114, United States,	2	\$71.745
4516065	Garrison Street, Boston, MA 02116, United States,	1	\$62.186
4044840	Garrison Street, Boston, MA 02116, United States,	1	\$68.865
2384107	A Street, Boston, MA 02210, United States,	1	\$84.772
1868513	Garrison Street, Boston, MA 02116, United States,	1	\$62.186
48612	Follen St, Boston, MA 02116, United States,	2	\$72.886

Table 24 - Total Annual Cost

The Total Annual Cost is made up of the sum of the Annual Cost previously calculated and the value resulting from multiplying the residual value, corresponding to 70% of the Average Property Acquisition Price, by the percentage of the Annual Financing Interest. To calculate the Total Annual Cost, we will use the following formula: $\text{Total Annual Cost} = \text{Annual Cost} + (\text{Residual } 70\% * 4.5\%)$.

ID	Total annual cost	Projected annual revenue	Annual net income	Initial cost	Breakeven Point in Months
14843783	\$115.380	\$125.640	\$10.260,40	\$173.400,00	203
12094488	\$71.561	\$113.750	\$42.189,40	\$87.516,00	25
11563716	\$127.790	\$113.977	-\$13.812,68	\$204.000,00	-177
9626428	\$74.422	\$101.360	\$26.938,21	\$98.085,75	44
9248612	\$76.579	\$126.000	\$49.421,30	\$88.230,00	21
8782592	\$96.001	\$104.100	\$8.099,20	\$142.800,00	212
7954808	\$116.600	\$100.165	-\$16.434,90	\$190.230,00	-139
7634365	\$109.048	\$117.453	\$8.405,20	\$164.449,50	235
7114655	\$68.511	\$104.400	\$35.889,49	\$82.352,25	28
5959251	\$59.606	\$112.125	\$52.519,17	\$62.927,63	14
5743939	\$71.745	\$102.060	\$30.314,64	\$90.257,25	36
4516065	\$62.186	\$107.280	\$45.093,78	\$69.825,38	19
4044840	\$68.865	\$107.280	\$38.414,90	\$83.334,00	26
2384107	\$84.772	\$126.000	\$41.227,75	\$108.477,00	32
1868513	\$62.186	\$107.280	\$45.093,78	\$69.825,38	19
48612	\$72.886	\$120.000	\$47.113,55	\$84.201,00	21

Table 25 - Projected Annual Revenue x Annual Net Income x Initial Cost x Break Even Point

Annual Revenue corresponds to the total amount collected from renting the property over a year, which was previously shown in Table 11. Therefore, at this point we will only reproduce the results already mentioned.

The **Annual Net Income** of a property is the value resulting from the difference between the **Annual Revenue** (total income obtained from renting the property) and the **Total Annual Cost**. That is, the **Annual Net Income** is the net amount that the property generated in a year, after subtracting all expenses. This is an important metric for evaluating the profitability of a real estate investment.

The **Initial Cost** corresponds to the value resulting from the sum between the **Annual Tax** and the **Value of Purchase Costs**, which were previously presented in Table 17 and Table 20, respectively. Therefore, at this moment we will only reproduce the results already mentioned and add them to calculate the **Initial Cost**.

The break-even point in a property is the moment when the revenues generated are equal to the total costs of the property, that is, it is the moment when there is no profit or loss.

The Breakeven Point is an important indicator for determining the profitability of a real estate investment, as it indicates how many months are needed for the property to be financially self-sufficient.

The objective of a real estate investment is always to surpass the Breakeven Point, thus generating profit for the owner. To calculate the Break-Even Point, we will use the following formula: Break-Even Point = (Initial Cost / Annual Net Profit) * 12.

ID	Total Initial Cost	Annual Net Income	ROI
14843783	\$734.400	\$10.260,40	1,40%
12094488	\$370.656	\$42.189,40	11,38%
11563716	\$864.000	-\$13.812,68	-1,60%
9626428	\$415.422	\$26.938,21	6,48%
9248612	\$373.680	\$49.421,30	13,23%
8782592	\$604.800	\$8.099,20	1,34%
7954808	\$805.680	-\$16.434,90	-2,04%
7634365	\$696.492	\$8.405,20	1,21%
7114655	\$348.786	\$35.889,49	10,29%
5959251	\$266.517	\$52.519,17	19,71%
5743939	\$382.266	\$30.314,64	7,93%
4516065	\$295.731	\$45.093,78	15,25%
4044840	\$352.944	\$38.414,90	10,88%
2384107	\$459.432	\$41.227,75	8,97%
1868513	\$295.731	\$45.093,78	15,25%
48612	\$356.616	\$47.113,55	13,21%

Table 26 - Total Initial Cost x Annual Profit x ROI

The Total Initial Cost of a property represents a set of pre-operating expenses that the owner will have to pay before he can make the property available for rent. To calculate the Total Initial Cost, we will use the following formula: $\text{Total Initial Cost} = 30\% \text{ Deposit} + \text{Purchase Cost Value} + \text{Annual Tax} + \text{Furnishing Costs}$.

As previously described, the Annual Net Income of a property is the value resulting from the difference between the Annual Revenue and the Total Annual Cost. Therefore, at this moment we will only reproduce the result already mentioned.

The Return on Investment (ROI) is a financial indicator that aims to evaluate the performance of an investment, comparing the profit obtained with the value of the Total Initial Cost. The ROI is calculated by dividing the Annual Net Income by the Total Initial Cost, multiplied by 100 to obtain the result in percentage.

ROI is an important tool to help investors evaluate the profitability of an investment in relation to the costs incurred. The higher the ROI, the more profitable the investment is considered.

It is important to emphasize that the ROI should not be considered in isolation for decision making, but in conjunction with other financial indicators for a more complete and accurate assessment of the investment's viability.

We can see that two properties have negative Annual Net Income and ROI, so we will automatically disregard properties ID 11563716 and ID 7954808 from our analysis.

Sequence	ID	Total initial cost	Annual net income	ROI	Break-even point
1	5959251	\$266.517	\$52.519,17	19,71%	14
2	9248612	\$373.680	\$49.421,30	13,23%	21
3	48612	\$356.616	\$47.113,55	13,21%	21
4	4516065	\$295.731	\$45.093,78	15,25%	19
5	1868513	\$295.731	\$45.093,78	15,25%	19
6	12094488	\$370.656	\$42.189,40	11,38%	25
7	2384107	\$459.432	\$41.227,75	8,97%	32
8	4044840	\$352.944	\$38.414,90	10,88%	26
9	7114655	\$348.786	\$35.889,49	10,29%	28
10	5743939	\$382.266	\$30.314,64	7,93%	36
11	9626428	\$415.422	\$26.938,21	6,48%	44
12	14843783	\$734.400	\$10.260,40	1,40%	203
13	7634365	\$696.492	\$8.405,20	1,21%	235
14	8782592	\$604.800	\$8.099,20	1,34%	212

Table 27 - Total Initial Cost x Annual Net Income x ROI x Break Even Point

After excluding properties with negative Annual Net Income and ROI, 14 were left for analysis. Since the purchase of these properties is focused on real estate investment and it is necessary to select the 10 most profitable ones, the break-even point will be a determining factor in choosing these properties.

The break-even point is the point at which the property begins to generate profit for the investor after all costs and expenses related to the property have been covered. We note that the last four properties listed (9626428, 14843783, 7634365, 8782592) have a Breakeven Point greater than 40 months, ROI less than 7%, Annual Net Income less than \$30,000, and Total Upfront Cost greater than \$382,000.

The most relevant information is that the break-even point of the last three properties listed is over 16 years, which is unfeasible for financial investment in properties. Therefore, we will exclude these last four properties from our analysis, and consequently we have already determined which are the 10 most profitable properties on the Airbnb Boston listing.

Sequence	ID	Total initial cost	Annual net income	ROI	Break-even point
1	5959251	\$ 266.517,00	\$ 52.519,17	19,71%	14
2	9248612	\$ 373.680,00	\$ 49.421,30	13,23%	21
3	48612	\$ 356.616,00	\$ 47.113,55	13,21%	21
4	4516065	\$ 295.731,00	\$ 45.093,78	15,25%	19
5	1868513	\$ 295.731,00	\$ 45.093,78	15,25%	19
6	12094488	\$ 370.656,00	\$ 42.189,40	11,38%	25
7	2384107	\$ 459.432,00	\$ 41.227,75	8,97%	32
8	4044840	\$ 352.944,00	\$ 38.414,90	10,88%	26
9	7114655	\$ 348.786,00	\$ 35.889,49	10,29%	28
10	5743939	\$ 382.266,00	\$ 30.314,64	7,93%	36

Table 28 - The 10 Most Profitable Properties on Airbnb Boston's Listing

Sequence	ID	Total initial cost	Annual net income	ROI	Break-even point
1	5959251	\$ 266.517,00	\$ 52.519,17	19,71%	14
2	9248612	\$ 373.680,00	\$ 49.421,30	13,23%	21
3	48612	\$ 356.616,00	\$ 47.113,55	13,21%	21
4	4516065	\$ 295.731,00	\$ 45.093,78	15,25%	19
5	1868513	\$ 295.731,00	\$ 45.093,78	15,25%	19
6	12094488	\$ 370.656,00	\$ 42.189,40	11,38%	25
7	2384107	\$ 459.432,00	\$ 41.227,75	8,97%	32
8	4044840	\$ 352.944,00	\$ 38.414,90	10,88%	26
9	7114655	\$ 348.786,00	\$ 35.889,49	10,29%	28
10	5743939	\$ 382.266,00	\$ 30.314,64	7,93%	36
Total Geral >>>>>		\$ 3.502.359,00	\$ 427.277,76	12,20%	23

Table 29 - Final Result of Financial Indicators

As we can see, the acquisition of these 10 properties or properties with very similar characteristics will be a great investment for our client.

Simultaneous purchase of these properties is highly recommended, as it will provide a complete view of the client's real estate investment, allowing better management to achieve their goals.

After a thorough financial analysis, we have determined that the Initial Investment (Total Cost) will be \$3,502,359.00, with an estimated Annual Net Income of \$427,277.76. The expected Return on Investment will be 12.20% and the Breakeven Point will be reached in 23 months.

That is, in just 2 years, the investor will start making profits with the properties, after covering all costs and expenses associated with them. This is an excellent result in the real estate investment market.

13 - Selected properties

Now that we have selected the 10 most profitable properties, let's add some more geographic information that will give us a better overview of the region in which these properties are located.

It is noted that owner Mike has the most properties listed on Airbnb Boston, in addition to being the host with the highest revenue.

Of the top 10 most profitable properties, three belong to Mike and are apartments located in the same building at the address: Garrison Street, Back Bay, Boston, MA, 02116, US. This address is represented in brown on the map.

Below is a list with information about the 10 selected properties.

ID	Number of bedrooms	Number of Bathrooms	owner name	Neighborhood	Address	Postal Code	Colors
12094488	2	1	Kim	South End	Union Park Street, Boston, MA, US	2118	Amarelo
9248612	2	1	Carmela	Beacon Hill	Goodwin Place, Boston, MA, US	2114	Verde
7114655	2	1	Sheryl	South End	East Berkeley Street, Boston, MA, US	2118	Vermelho
5959251	1	1	Lynne	Beacon Hill	Beacon Street, Boston, MA, US	2108	Roxo
5743939	2	1	Lev	Beacon Hill	Cambridge Street, Boston, MA, US	2114	Azul
4516065	1	1	Mike	Back Bay	Garrison Street, Boston, MA, US	2116	Marrom
4044840	1	1	Mike	Back Bay	Garrison Street, Boston, MA, US	2116	Marrom
2384107	1	1	Max	South Boston	A Street, Boston, MA, US	2210	Preto
1868513	1	1	Mike	Back Bay	Garrison Street, Boston, MA, US	2116	Marrom
48612	2	1	Cecile	Back Bay	Follen St, Boston, MA, US	2116	Cinza

Table 30 - Information about the properties

Below is an aerial view of the city of Boston with the geographic points of the properties.

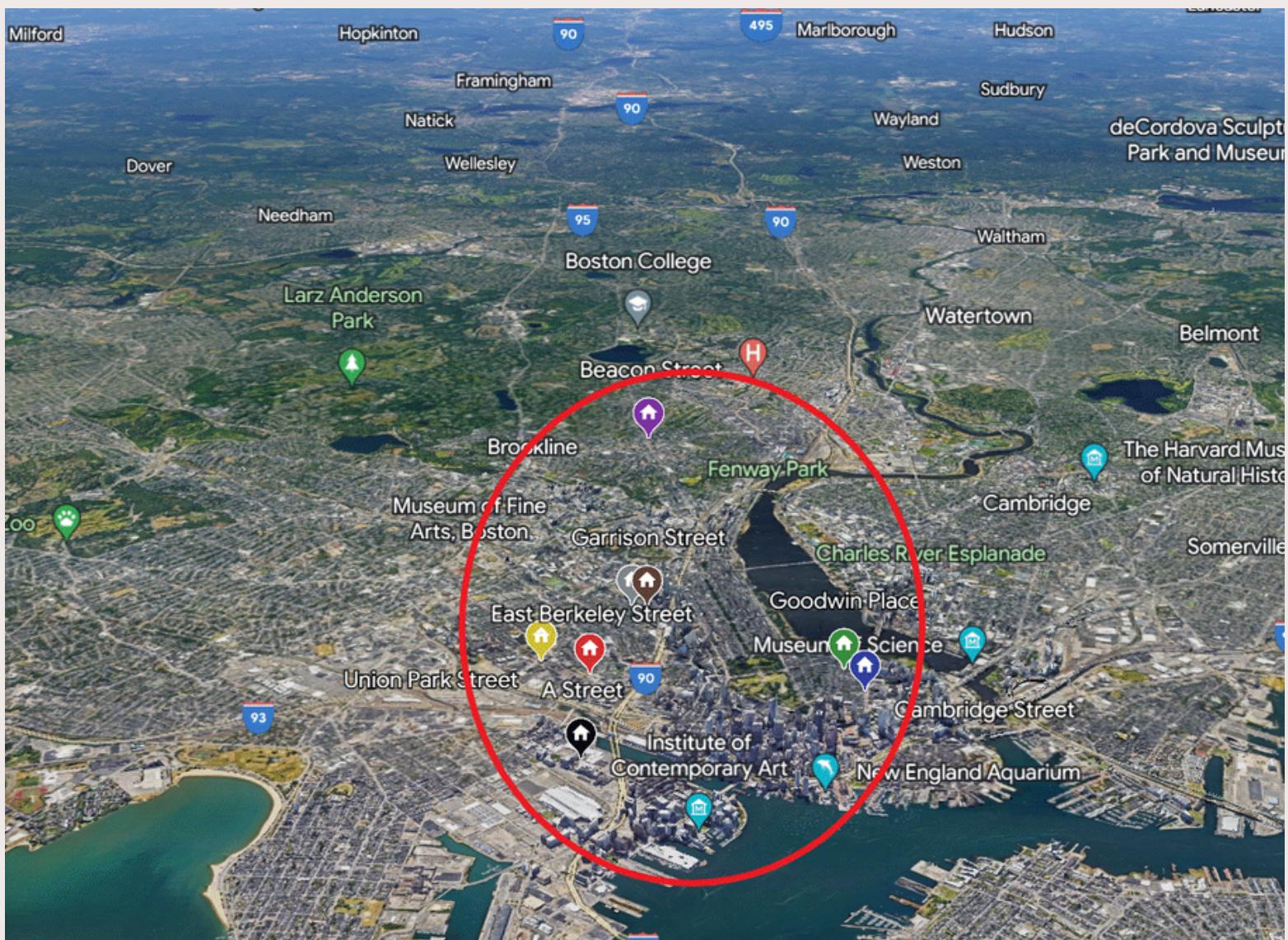


Image 01 – Geographical points of the 10 properties recommended to our client.

14 - Final Recommendations

 Focus on apartments with 01 or 02 bedrooms with 01 bathroom.

 Follow the property recommendations listed in Table 30 and focus on buying properties in the Back Bay, South End, Beacon Hill and South Boston neighborhoods.

 Book a night at 10 properties to assess quantitative and qualitative characteristics about properties.

 Benchmark to understand how owner Mike (ID: 9419684) became a Top Host with annual revenue of \$2,618,351.00 with properties (Entire home/apt), with three apartments listed in the final 10 recommendations.

 Keep the room rate between \$298 and \$375.

 Keep the occupancy rate greater than 80%.

 Make an Initial Investment of \$3,502,359.00 to invest in the 10 properties, the project has shown that the estimated Annual Net Income will be \$427,277.76. The expected Return on Investment will be 12.20% and the Breakeven Point will be reached in 23 months, that is, less than 02 years.

 Do a study on properties in the same building or condominium as the top 10 recommended properties, in case the owners do not want to sell the properties. Properties in the same buildings or complexes tend to have similar features and prices.

Thanks!

"Without analysis, data is just guesswork." - W. Edwards Deming.

"Data analytics is a lens that allows us to see beneath the surface and discover patterns that can change the world." - David McCandless.