NYC REAL ESTATE CASE STUDY

AD 571 BUSINESS ANALYTICS FOUNDATIONS

ASSIGNMENT 3

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Executive Summary

Voted the 7th coolest neighborhood in the world by Vogue Magazine, Bushwick is an ultra-hip area characterized by its dive bars, art galleries, and bodegas on nearly every corner. Over 90% of properties in Bushwick are within a few miles of a park, and the housing stock is both varied and unique. With more than 30 schools and an up-and-coming vibe, it's no surprise that more and more people are moving to this Brooklyn neighborhood (*2024, p. Property shark*). The population density in Bushwick is quite high, approximately 55,950 people per square mile, reflecting its popularity and compact nature.

This report evaluates the feasibility of starting a real estate company in Bushwick by analyzing key market metrics such as total sales, mean sale prices, gross square footage, and sales proportions by property type. This analysis was conducted using RStudio, including a k-means clustering comparison with other neighborhoods and a hypothesis test to compare Bushwick's residential property costs with Bedford-Stuyvesant. The findings offer valuable insights into Bushwick's real estate market dynamics and investment potential.

Descriptive statistics reveal a consistent increase in total sales and mean sale prices in Bushwick, indicating a growing market with high demand. The wide range of sale prices and property sizes presents opportunities to cater to various market segments, from affordable to luxury properties. The high proportion of residential sales suggests a stable market, while the strong correlation between sale price and property size can guide effective pricing and development strategies. The k-means clustering analysis places Bushwick in a competitive market position, and the hypothesis test shows no significant difference in average residential property costs between Bushwick and Bedford-Stuyvesant. These insights underscore Bushwick's potential for high returns and strategic growth, making it an attractive location for establishing a real estate company.

Descriptive Statistics

Total Number of Sales Since 2009:

The total sales volume in Bushwick has shown a general upward trend with some fluctuations. In 2019 due to the pandemic sale volume decreased but then it quickly regained the uptrend. Notably, the total sales in 2021 reached a peak of $979,807,678 indicating a strong market presence (*Appendix 1*). Consistent sales growth over the years demonstrates a healthy demand for real estate in the neighborhood.

Mean Sale Price and Gross Square Footage for Residential Properties:

The mean sale price and gross square footage for residential properties have generally increased over the years, with significant growth in 2021(*Appendix 2*). Mean Sale Price (2021): $3,797,704, Mean Gross Square Footage (2021): 6,820. The increasing mean sale prices suggest a rising valuation of properties, which can be favorable for a real estate company looking to capitalize on appreciating asset values.

Five-Number Summary:

The five-number summary for sale prices and gross square footage in Bushwick reveals a wide range of property values and sizes (*Appendix 3*). For sale prices (in $), the minimum is 200, the 1st quartile is 400,000, the median is 670,000, the 3rd quartile is 1,055,000, and the maximum is 256,795,000. For gross square footage (in sqft), the minimum is 153.0, the 1st quartile is 2,400.0, the median is 3,000.0, the 3rd quartile is 4,124.5, and the maximum is 388,023.0.

This variability indicates opportunities for catering to different market segments, from affordable housing to luxury properties.

Proportion of Sales by Property Type:

The proportions of different property types sold in Bushwick are predominantly residential (79.62%), followed by commercial (10.64%), mixed (6.79%), and other (2.96%). The dominance of residential sales aligns with the primary focus of many real estate companies and suggests a stable residential market (*Appendix 4*).

Standard Deviation of Sale Prices for Residential Properties:

The standard deviation of sale prices indicates the variability in the market (*Appendix 5*), with recent years showing higher volatility: 2021: $22,371,113. Higher variability can imply greater investment risk but also potential for higher returns, especially if market trends are correctly anticipated and leveraged.

Correlation Between Sale Price and Gross Square Footage:

The correlation between sale price and gross square footage is 0.8966438, indicating a strong positive linear relationship (*Appendix 6*). This suggests that larger properties tend to fetch higher prices, which can inform pricing strategies and property development plans.

K-means Clustering

To compare Bushwick to other neighborhoods, a k-means clustering analysis was performed using the following KPIs (*Appendix 7*): Median Sale Price: This represents the central tendency of property prices. Number of Sales: Indicates the volume of transactions and market activity. Price per Gross Square Foot: Reflects the value per unit area, providing insight into property valuations.

Clustering Results:

Bushwick is part of a market segment characterized by moderate to high median sale prices ($300,000 to $3,000,000) and average prices per square foot ($200 to $3,000). This places it in a lucrative segment, appealing to both mid-range and high-end buyers. The alignment of Bushwick's pricing and transaction volume with other strong real estate markets highlights its competitive position. This competitive edge is critical for attracting investors and buyers, indicating a robust market presence and a strong potential for growth and profitability in the real estate sector.

The cluster analysis identifies neighborhoods with similar market conditions, suggesting that strategies successful in other cluster 1.00 neighborhoods are likely to be effective in Bushwick. The standard deviation of sales indicates moderate market volatility, which, while presenting some risk, also offers significant potential for high returns, making it a balanced investment opportunity. Understanding the clustering helps in making strategic decisions related to market entry, pricing, and target demographics. Bushwick's inclusion in cluster 1.00 suggests a viable and profitable market for new real estate ventures, supported by strong market dynamics and strategic positioning.

Hypothesis Testing

A Welch Two Sample t-test (*Appendix 8*) comparing Bushwick to Bedford-Stuyvesant since 2009 yielded the following results: t = -1.14311, df = 5366.5, p-value = 0.149, 95% confidence interval: [-295717.55, 44032.67], Mean of Bushwick: $918,024.1, Mean of Bedford-Stuyvesant: $1,004,686.5

The p-value indicates no statistically significant difference in average residential property costs, suggesting that Bushwick's property market is comparable to Bedford-Stuyvesant, a neighborhood known for its robust real estate market.

Decision-Making Insights

Based on the analysis, several key insights guide the decision to start a real estate company in Bushwick. The consistent increase in total sales and mean sale prices indicates a growing market with high demand, making Bushwick a potentially lucrative area for real estate investment. The wide range of sale prices and property sizes offers opportunities to cater to various market segments, from affordable to luxury properties. Additionally, the high proportion of residential sales aligns with common real estate business models, providing a stable foundation for a new company. The strong correlation between sale price and property size can inform effective pricing and development strategies, ensuring competitive offerings in the market.

Furthermore, the similarity in average property costs with Bedford-Stuyvesant suggests that Bushwick is a competitive market, offering comparable opportunities without significant additional risk. The k-means clustering analysis positions Bushwick in a favorable cluster with strong market dynamics, reinforcing its viability for new market entrants. This cluster analysis helps in understanding competitive positioning and potential investment opportunities. Collectively, these insights highlight Bushwick's potential for high returns and strategic growth, making it an attractive location for establishing a real estate company.

Conclusion

Given the positive market trends, the diversity in property offerings, and the stable residential market, Bushwick presents a favorable environment for starting a real estate company. The potential for high returns, driven by increasing property values and a strong correlation between price and size, further supports this decision. Strategic planning and market positioning can leverage these insights to establish a successful real estate business in Bushwick.

APPENDIX 1: *a) The total number of sales in the BUSHWICK neighborhood since 2009:*

```
> summarise(Bushwick_Res_group,TOTAL_SALES = sum(SALE_PRICE))
# A tibble: 13 × 2
   SALE_YEAR TOTAL_SALES
       <dbl>       <dbl>
 1      2009   128074386
 2      2010   143799232
 3      2011   132067944
 4      2012   244497207
 5      2013   338104312
 6      2014   511584179
 7      2015   551554426
 8      2016   512482601
 9      2017   452192909
10      2018   496234142
11      2019   391065045
12      2020   335012843
13      2021   979807678
```

APPENDIX 2: *b) The mean sale price and gross square footage for RESIDENTIAL properties in the BUSHWICK neighborhood since 2009:*

```
> summarise(Bushwick_Res_group,MEAN_SALES = mean(SALE_PRICE),MEAN_GROSS_SQ_FT=mean(GROSS_SQUARE_FEET))
# A tibble: 13 × 3
   SALE_YEAR MEAN_SALES MEAN_GROSS_SQ_FT
       <dbl>      <dbl>            <dbl>
 1      2009    502252.            3550.
 2      2010    524815.            3842.
 3      2011    434434.            3760.
 4      2012    519102.            4072.
 5      2013    534130.            3564.
 6      2014    903859.            4243.
 7      2015   1066836.            3798.
 8      2016   1180835.            3665.
 9      2017   1333902.            3551.
10      2018   1305879.            3466.
11      2019   1427245.            3561.
12      2020   1791513.            4066.
13      2021   3797704.            6820.
```

APPENDIX 3: *c) A five-number summary for both sale price and gross square footage for RESIDENTIAL properties in BUSHWICK neighborhood since 2009:*

```
> fivenum(Bushwick_Res_group$SALE_PRICE)
[1]        200     400000     670000    1055000 256795000
> fivenum(Bushwick_Res_group$GROSS_SQUARE_FEET)
[1]     153.0    2400.0    3000.0    4124.5  388023.0
```

"Min" "1st Quartile" "Median" "3rd Quartile" "Max"

APPENDIX 4: *d) The proportion of sales of residential, commercial, mixed, and other properties in the BUSHWICK neighborhood since 2009:*

```
> PROP2*100
  COMMERCIAL        MIXED        OTHER  RESIDENTIAL
   10.641393     6.787506     2.955328    79.615773
```

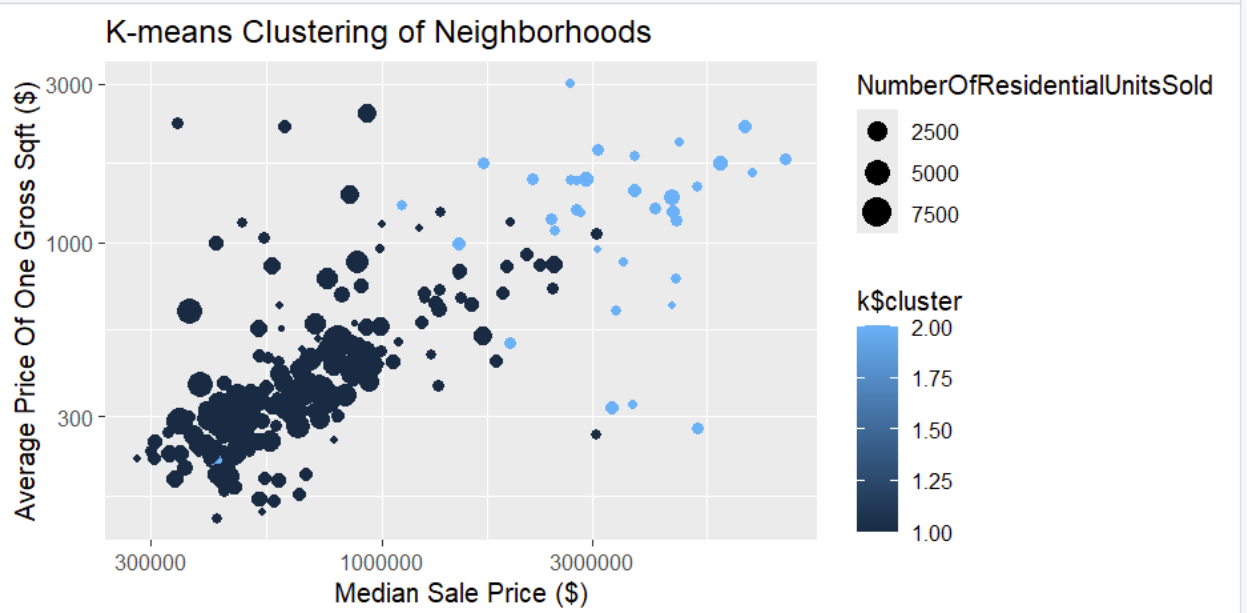
APPENDIX 5: *e) The standard deviation of sale prices for RESIDENTIAL properties in the BUSHWICK neighborhood since 2009:*

```
> summarise(Bushwick_Res_group,SD_SALES_PRICE = sd(SALE_PRICE))
# A tibble: 13 x 2
   SALE_YEAR SD_SALES_PRICE
       <dbl>          <dbl>
 1      2009        765355.
 2      2010       1022846.
 3      2011        452515.
 4      2012        594304.
 5      2013        416107.
 6      2014       2711118.
 7      2015       1843312.
 8      2016       1201837.
 9      2017       2927093.
10      2018       3190690.
11      2019       1512484.
12      2020       4610314.
13      2021      22371113.
```

APPENDIX 6: *f) The correlation between the sale price and gross square feet for RESIDENTIAL properties in the BUSHWICK neighborhood since 2009:*

	MEAN SALE_PRICE	MEAN_GROSS_SQUARE_FEET	CORR
BUSHWICK	0.8966438	0.8966438	0.8966438

APPENDIX 7: *2) k-means clustering, comparing BUSHWICK neighborhood to other neighborhoods:*



APPENDIX 8: *3) Hypothesis Test: Comparing Average Residential Property Costs in Bushwick and Bedford-Stuyvesant:*

```
> t.test(x=BUSHWICKdata$SALE_PRICE,y=BEDFORDSTUYVESANTdata$SALE_PRICE,alternative = "two.sided",conf.level=.95)

        Welch Two Sample t-test

data:  BUSHWICKdata$SALE_PRICE and BEDFORDSTUYVESANTdata$SALE_PRICE
t = -1.4431, df = 5366.5, p-value = 0.149
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -289717.55   44032.67
sample estimates:
mean of x mean of y
 918024.1 1040866.5
```

REFERENCE:

1. (2024, May 5). Propertyshark.com. https://www.propertyshark.com/mason/market-trends/residential/nyc/brooklyn/bushwick