YOUR GROSS PROPERTY TAX ASSESSMENT: WHAT DOES IT MEAN?

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ALY6070: Communication & Visualization

03/10/2019

Mid Term Assignment

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Abstract

Our project aims at determining the various patterns and trends around the Gross Tax levied on various types of properties across Boston. The analysis is divided into two parts: Gross Tax for Boston and Gross Tax for Commercial Land Use. "Gross Tax for Boston" focusses on determining the linearity between the assessed land value and gross tax. Also, the gross tax for two types of land uses is given for some neighborhoods of Boston. "Gross tax for Commercial Land Use" aims at providing insights on the average gross tax for different types of commercial structure and the forecast of gross tax for commercial properties in Boston from 2017 to 2036. Thus, selecting the type of building structure and neighborhood becomes easier for them with respect to their requirements.

Keywords:

ZIPCODE	Zip codes of various neighborhoods across Boston.	LU	Type of land use.
AV_TOTAL	Total assessed land value of the property.	STRUCTURE_CLASS	Structural classification of the assessed building.
GROSS_TAX	Total tax levied on the assessed land value.	YR_BUILT	Year the assessed property was built.

Problem Statement

What is the estimated gross tax levied on the neighborhoods across Downtown Boston? How does the average gross tax for commercial and industrial type of land use across different neighborhoods of Boston and how has it changed over the time for commercial sector?

Data Preparation

Property Assessment data used in the analysis was retrieved from the Boston Government website. The CSV file was imported, and the unwanted variables were excluded. To make the

analysis easier new CSV files with the variables mentioned in the abstract. Visualization was kickstarted by loading these CSV files in TABLEAU. Using Data Interpreter in Tableau, data was cleaned by removing missing and null values & transformed to finally put the data to use.

Dashboard 1: Gross Tax in Boston

Average Gross Tax across Boston for different type of land uses.

Objective & Type of visualization used: To show the value of average gross tax for two types of land uses (Commercial and Industrial) across different neighborhoods of Boston. Vertical Bar Graphs are used as they are easy for eyes to draw comparisons between the lowest and highest peak.

Methods & Insights: With the help of above illustrations, we can determine the concentration of commercial and industrial land uses across the Downtown Boston based on the average value of gross tax. Five major areas of Downtown Boston are used for analysis. Boston Harbor Area, Back Bay Area and South Boston consists a major chunk of the commercial spaces across Boston as the average gross tax is relatively high. The South Boston Area has a comparatively lower land value than the other areas which leads to a higher number of industries in that area. Proximity to the downtown offices and a lower land value attracts more industrial owners to set up factories and warehouses. A higher land value does not allow many industries to set business in downtown areas like Boston Harbor and Back Bay.

Relationship between Gross Tax and Assessed Land Value

Objective & Type of Visualization: To determine the linearity between the median gross tax value and the median assessed land value in Boston. Scatter Plots are quite useful in determining the linear relationship between the two variables and the trend line obtained also aids in giving an estimate of the future value of the dependent variable.

Methods and Insights: The variables used in the plot are: Zipcode, Gross Tax and Av Total. By taking the median of the Gross Tax and the Av Total, a scatter plot was created which aims to show the linearity of the variables. The trend line created shows that the data points are quite linear and statistically significant to each other as the R-Squared value was obtained as 0.6635 and p-value was < 0.001. The zip codes help in determining the area of assessed land across the neighborhoods of Boston. This shows that the value of gross tax can be determined with varying values of the assessed land. **[Figure 1]**

Dashboard 2: Gross Tax for Commercial Properties

Difference in Average Gross Tax between Building Structure and Land Use.

Objective & Type of Visualization: Through this textual visualization, the intention is to show difference in average gross tax between building structure and land use. Tabular Heat Map is used to easily demarcate the differences in average gross tax between the variables- Land Use and Structure Class. Such a visualization is crisp and easily inferable for handful number of variables.

Methods and Insights: Commercial buildings made from steel have a bigger floor plate, thus a larger area relative to residential structure. The volume of steel used is more than the volume of concrete leading to a higher cost which implies higher gross tax. This phenomenon can be observed from the gross tax value of commercial and residential land use. The table also shows exorbitant difference in average gross tax paid by commercial property compared to residential property when both are made of steel. When this difference is compared to the tax paid by commercial property and residential property when both are made of reinforced concrete, it is quite high. **[Figure 2]**

Dashboard 3: Commercial Gross Tax Forecast

Objective & Type of Visualization: To determine the range of gross tax for commercial properties in Boston by forecast analysis from the years 2017 to 2036. Time Series Plot. To determine the

forecast values over a period of 20 years, a time series plot was essential as through the plot, the past values as well as the future values can be visualized in the same plot.

Methods and Insights: The variables used in this plot are: LU, ZIPCODE and Gross Tax. Thus, by getting a range of values, the companies can get an estimate of what tax would be levied on them for the given year. From the plot, we get the range of forecasted values from approx. -20M$ to 60M$ with a confidence level of 95%. Since, the gross tax cannot be negative, we consider the negative values as redundant. A line of average showed that the forecast of gross tax was higher than the overall average of commercial gross tax in Boston. **[Figure 3]**

Conclusion

We observe a positive linear trend of the gross tax with respect to assessed value of land. In Downtown Boston, the Back-Bay Area and Boston Harbor Area are the hotspots for commercial spaces. Most of the industries are concentrated in South Boston Area. Steel Structures attract a higher value of gross tax than the reinforced concrete structures. The forecast of the gross tax for commercial spaces in the next twenty years is higher than the overall average of the median gross tax.

Reference

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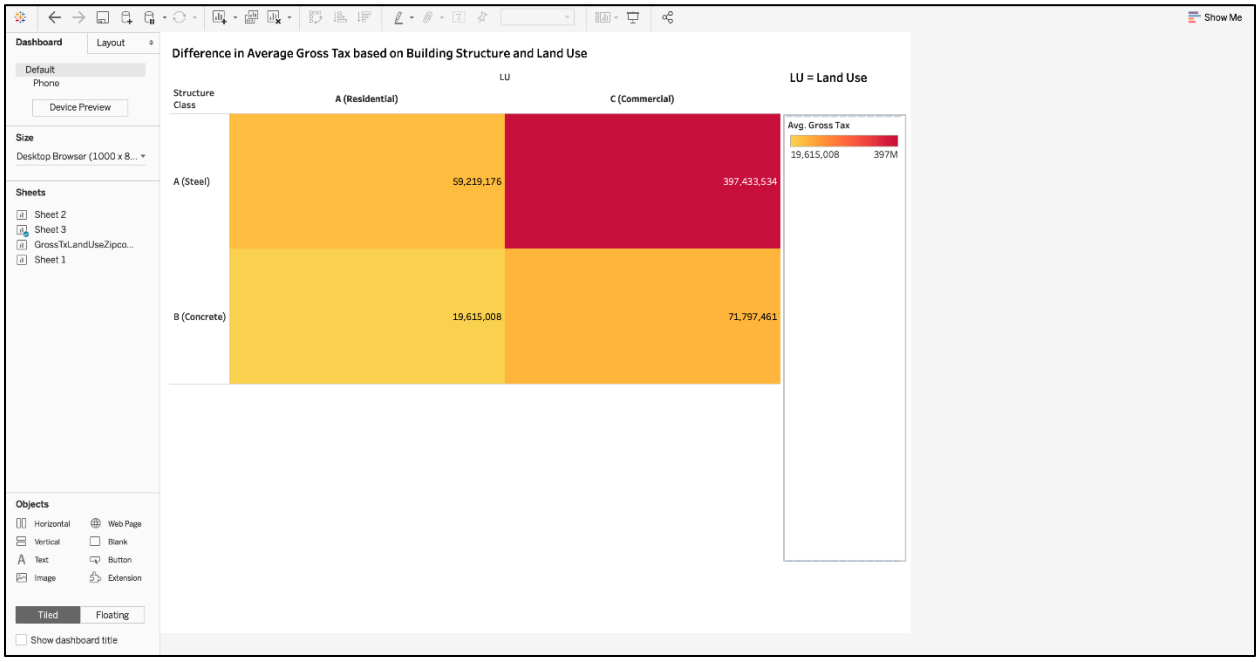
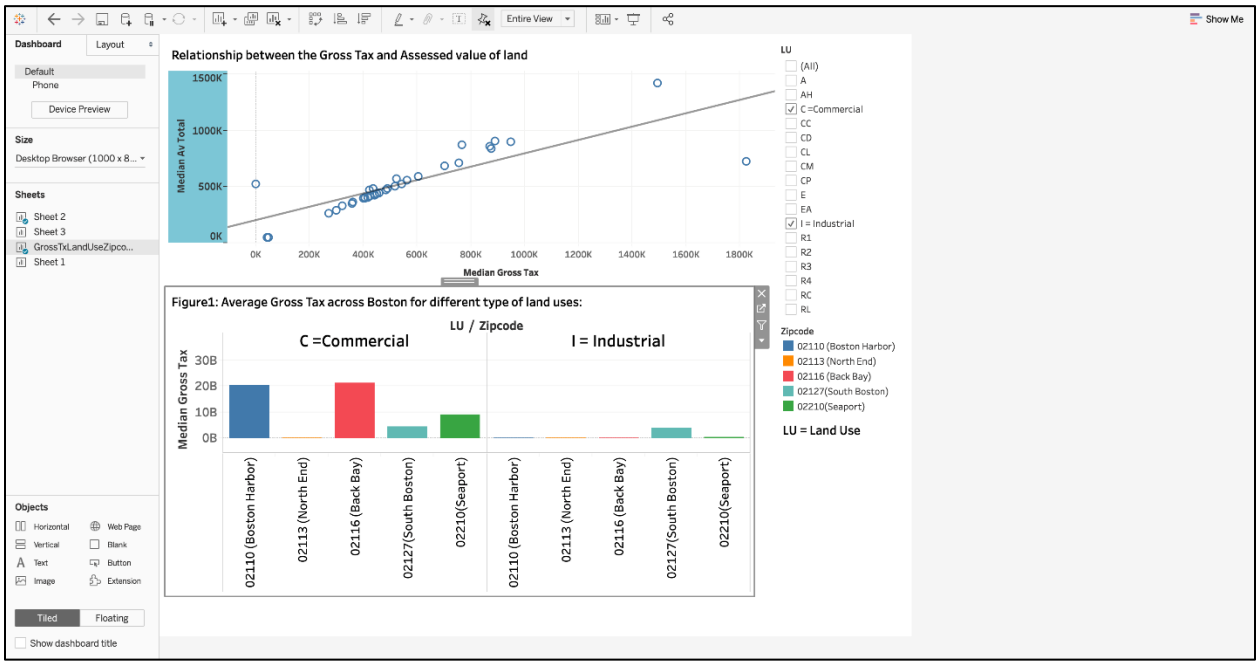
Appendix

Figure 1:



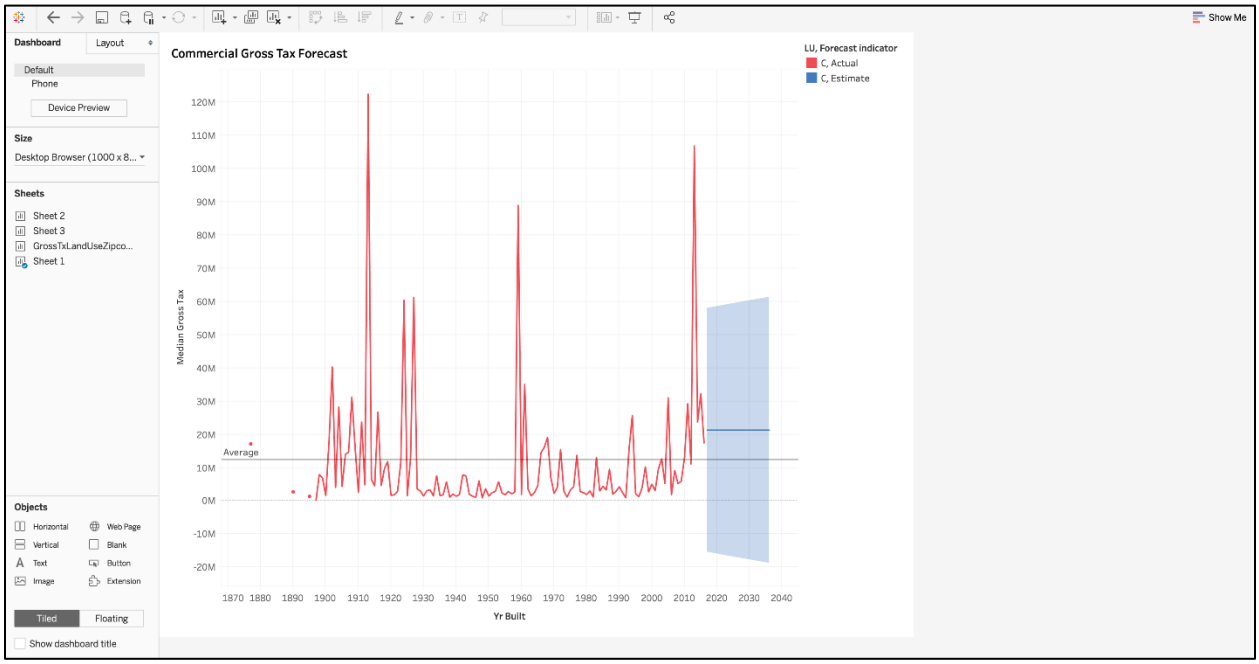
"Difference in Average Gross Tax Based On Building Structure And Land Use"

Figure 2:



"Relationship between Gross Tax and Assessed Value of Land"

Figure 3:



"Commercial Gross Tax Forecast"