DATA 601: Factors That Influence Property Assessments in the City of Calgary

Team: Dany El-Hachem, Atlanta Liu, Greg Cameron

Introduction

The City of Calgary releases property assessments for all properties in the City of Calgary on an annual basis. The accuracy of these assessments are important to consider, as they play a critical role in determining how much the government should charge property owners for their taxes. For individuals who do not currently own any residential property, understanding the different factors that affect the accuracy of property assessments may be helpful should they ever find themselves in a position to purchase residential property. Since the values of property assessments are based on similar properties used to evaluate the market value of the house (*Property Assessment* 2019), we can also get a glimpse of general housing prices in various communities across the city.

Knowing this, we plan on investigating several external factors that influence property assessments to understand which of them has the most impact. In this study, we are looking to determine how economic downturns, changes in population, and crime rates have an impact on residential property assessments in the City of Calgary. The datasets for each factor will be obtained from Open Calgary. Using the data wrangling and visualization methods learned in class, we will be conducting exploratory data analysis of these factors on residential property assessments in Calgary to provide some insight into our guiding questions.

Dataset Description

We made use of Open Calgary, the City of Calgary's open data portal, where we obtained several datasets to work with in an attempt to answer several guiding questions. These datasets are:

Property Assessments:

- This is the central dataset we will be using for this investigation. This dataset contains the property assessments in Canadian dollars (CAD) for all properties in the City of Calgary from the years 2005 to 2019 along with geographical information such as latitude, longitude, and community names.

Calgary's Population, 1958-2019:

- This dataset shows the changes of yearly residents and dwellings in Calgary from January 1958 to January 2019. For our study we are only interested in the resident count, as they are the primary factor that determines the population of our city in this dataset. Additional columns of interest include "Community Names" & "Community

Code". These will help us organize property assessment & population changes by community.

Community Crime and Disorder Statistics:

- This data set categorizes monthly crime occurrences based on location. The primary columns of interest are the Crime Count, Category of Crime, and Community Names.

All the datasets used are in comma separated value (csv) format, and are up to date as of September 2019. The City of Calgary gives us the freedom to "copy, modify, publish, translate, adapt, distribute or otherwise use the Information in any medium, mode or format for any lawful purpose" as long as we acknowledge it as a source and provide a link to the license.

We will be using one additional dataset; a historical monthly WTI (West Texas Intermediate) price downloaded from Investing.com in csv format. The terms and conditions available on the website grant permission to use these data.

Guiding Questions

To address how our three factors (economic downturn, population growth, and crime rates) have impacted property assessments, we developed three guiding questions that will be answered through the exploration of our data.

1. *How has the economic downturn (decrease in oil price) affected the residential property assessments in Calgary?*

    - Calgary has been impacted by the cyclical nature of the oil and gas industry since the first oil was discovered in Alberta in the early 20th century. As Calgary became the centre of Canada's petroleum industry, the cities' fortunes have become intrinsically tied to the price of oil. The current downturn has spanned the last 5 years, with the North American benchmark price, West Texas Intermediate (WTI) falling from $112/barrel in June 2014 to $26/barrel in 2016. The recovery has been slow, dramatically impacting the oil company revenues, and ultimately leading to large rounds of lay-offs of oil and gas employees. How has the economic downturn in Calgary impacted property the property values in the city? Has the impact been felt equally throughout the city?

2. *How does population growth lead to changes in property assessments over time?*

    - The Calgary Census (2016) reported that Calgary is one of the fastest growing population in Alberta, reaching a population growth rate of 14.6% from 2011 to 2016. Additionally, it has one of the highest home ownership rates compared to all major Canadian cities. With the constant rise of homeowners and housing demand, it is important to understand how community property assessments are affected by this, as

property taxes may increase. Addressing this question will hopefully provide readers with a greater understanding of how property tax values are affected by population changes within a community, as well as provide estimates for changes in general housing prices as a result of population increase.

3. *What is the relationship between crime rates and property assessments?*

    - All types of crime lead to indirect costs to society at large, which might lead to economic effects further down the line. Although it is difficult to directly attribute declining property assessments to criminal incidents, several studies have shown that there is indeed a link between certain types of crime and a decrease is housing values (Maximino 2017; Campbell 2007). For example, the socio-economic effects of crime in a community is quite visible. New residents will tend to avoid neighborhoods with elevated crime rates, while current residents might look to move elsewhere. On the other hand, neighborhoods that are considered safe might be more expensive due to higher demand, seeing how safety is ranked higher than price when it comes to buying a new home. Visualising the data on property assessment values and crime rates in select communities in Calgary will further shed some light on whether or not these two things are related.

Tasks

We will be using the Jupyter Notebook Environment, coding in Python using the following libraries to assist with our data wrangling and visualization:

- Pandas, Numpy, Matplotlib, and Plotly

Property Assessments and the Economy (Greg):

- Using the historical monthly WTI dataset, we will look at how property assessments were affected by the recent economic downturn due to the decrease in oil prices. Comparing the change in assessments of large downtown office buildings to several residential communities, we will contrast the impact to corporations versus the individual property owner.
  We will visualize the impact by graphing the oil prices and the property assessments against time in years on a line graph. To gain an understanding of how different regions of cities were impacted, we will also look at a map of the city, with property assessment changes plotted in colour. To summarize the findings, we will graph the property assessment change versus two influencing factors: distance from the city centre and the mean/median property assessment for the community.

Property Assessment and Population Change (Atlanta):

- Comparing the change of property assessments with respect to the change of population over the years within a certain community is another factor we will be looking into using these datasets. We will be plotting the mean assessed value per year of residential households as well as the population growth rate per year for select communities in Calgary to see whether or not these variables are related or not. The population and assessment change will be plotted against the year for each community chosen. If such a relationship exists, we should find a correlated increase/decrease in the plotted data. This will be visualized through a line graph overlapping a histogram (both plots in one figure). The line graph would represent the population growth rate per year (ie. 1.2% population increase between 2001 & 2002) and the histogram represents the corresponding change in mean assessed value per year in that community (ie. $200k mean assessed value for all houses in community X throughout 2001).

Property Assessments and Crime and Disorder Statistics (Dany):

- Looking at the “Community Crime and Disorder Statistics” dataset along with the “Property Assessments”, several interesting questions arise. Is there a correlation between the amount of crime occurring in a community and the assessment of properties in that community? If so, what category of crime (violence, theft, disorder…) has the most impact?
  To analyze these questions, we will construct a table that contains the property assessments of that community, as well as the crime count. Visually, this will be presented as a plot showing a line graph for the property assessment per community, and a bar graph showing the number of crimes in that community. If there is a relationship, we should see a similar trend in both graphs. If such a relationship was found, we will be looking in further detail attempting to determine which category of crime has the most impact. Finally, we will look at the community with the highest crime rates to see if it also has the lowest property assessment.

References

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