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ECNS 460

Term Project Plan

10/10/24

Topic:

Our research question is defined as follows: “If a zone is re-classified Bozeman, how will the housing prices in that area change compared to prices in other zones”. Our topic involves analyzing trends and changes in real estate prices in Bozeman and comparing them between districts that have recently been changed in their zone classification, and those that have not. This will allow us to analyze a potential causal effect of the rezoning on increased fluctuations in home or rental listing prices.

Plan for Analysis Stage:

This project will explore option A to answer a research question. A causal analysis will be utilized to determine the effect of rezoning a district on housing prices, since Bozeman has had a number of rezoned areas in recent history. Regression modeling will be employed to identify predicted differences in housing prices between zones of interest. In this context, this would involve estimating the coefficient of the treatment variable: re-zoned or not re-zoned. We will then attempt to conduct statistical inference on the model to determine if any of the identified trends are significant or meaningful based on the assumptions and reasoning on the data and variables used.

Our methods will involve web scraping real estate listings and historical data on the Bozeman housing market and creating a database of this information. We will collect and store city zoning data as well in the database. The data will primarily consist of observations concerning zoning changes in the past couple of years, but we may explore other historical trends at different points in time to conduct a comparative analysis if time permits. Given that housing markets are inherently influenced by geographical factors, a spatial analysis will be utilized to detect patterns in real estate prices between zones. The specific classification of zones and what types of buildings are allowed to be built will factor into the analysis, since each zone classification allows and disallows certain types of developments. The data collected will be cleaned and processed to meet acceptable standards and our assumptions will be checked against the model.

There is some inherent selection bias in this problem, since zones in Bozeman that are reclassified are likely different in terms of building types and construction incentives. A causal interpretation could be considered plausible if recently rezoned areas are not significantly different from the other areas in terms of housing development qualities, infrastructure, distance from important locations, and other differentiating factors. A bias that may be present in which zones are reclassified is that recently changed zones may have already been experiencing greater housing price changes or demand, which led to the city rezoning them. The findings of the analysis may not necessarily be generalizable to other zones that are structurally and geographically different from those that are considered in the rezoning.

Undertaken Challenge:

In this project, we have chosen to incorporate spatial analysis as our challenge to enhance our understanding of housing price trends in Bozeman across zoning classifications. This approach will allow us to examine geographical/zone patterns and their influence on housing prices, going beyond the basic techniques covered in class. We will also perform web scraping beyond the examples covered in class to retrieve zoning and housing price data.

To accomplish this, we will first collect relevant geospatial datasets, including county level data, demographic information, and other location-specific factors. This data will provide essential context for our housing price analysis. Additionally, we will perform spatial clustering analysis to detect patterns and groupings in housing price trends. This analysis will enable us to determine whether specific areas in Bozeman exhibit similar price fluctuations and explore zoning changes influencing these patterns.

Data:

- City of Bozeman Geographic Information System (GIS): Contains csv data on zone areas in Bozeman. The data is continually updated by either the city of Bozeman or the planning division (with a variable listing who last edited a zone). The data set includes variables: "ObjectID" (id for each zone), "Zoning" (zoning classification), "last_edited_date" (date of most recent update), "STR_TYPE[1-3]" (short term rental classification variables), "Muni_Hyperlink" (hyperlink code for zone), "Shape_Area" (zone area), "Shape_Length" (zone length). The time span goes

<https://public-bozeman.opendata.arcgis.com/search?tags=Zoning>

- Gallatin County Property Records: Property record data sorted by address. Contains data on market value, lot size, building size, bed count, etc.

<https://www.countyoffice.org/brentwood-ave-bozeman-mt-property-records/>

- Zillow Real Estate Listings in Bozeman: This is home and rental listing data that will need to be scraped.

<https://www.zillow.com/bozeman-mt/>

- RedFin Bozeman Housing Market Data: Another source of home and rental listings that will be scraped.

<https://www.redfin.com/city/2317/MT/Bozeman/housing-market>

- ArcGIS City of Bozeman Zoning: Interactive Map of zones (not a data set but a web interactive map that can be implemented in R)

<https://www.arcgis.com/apps/webappviewer/index.html?id=59e315bce7b84d6bbcf22fbd3fa9460b>

- Bozeman Municipal Code: Has useful zone classification tables that will be web scraped. Provides more information on types of dwelling allowed in each type of zone, such as two-household dwelling, community residential facilities, group living, etc.

https://library.municode.com/mt/bozeman/codes/code_of_ordinances?nodeId=PTIICOOR_CH38UNDEC_O_ART3ZODILAUS_DIV38.300ZOMADE_PT2ZODIINPUST_S38.300.100REZODINTPU

- City of Bozeman Planning and Community Developments: Not a data set, but provides useful information on proposed planning for future analysis.

<https://gisweb.bozeman.net/Html5Viewer/?viewer=planning>

The spatial coverage of the data is confined to Gallatin County. Most data sets are recently updated, and span back a few years. The data sets are related to each other in that they are all location specific and relate to either addresses or areas of real estate in Bozeman.