

Property Reassessment Prediction in Allegheny County, Pennsylvania, USA

i. Project Description

The home-buying process in the United States is a complicated process where a homebuyer must consider a variety of factors before making a purchase. In Pennsylvania, property taxes are set at the county level, with taxes being paid to your school district, municipality, and county.ⁱ Allegheny County – which is Pennsylvania’s second-largest county and home to Pittsburgh – has tax rates which vary widely from effective rates ranging from about 5% of property value to 2.3% of assessed valueⁱⁱ. For a home price of \$200,000, the high end of the property tax range would have owners paying over \$800 per month for taxes alone, while the lower end would have homeowners paying about \$383 per month.

Beyond the difference in tax rates by municipality and school district, the general wisdom is that specific municipalities more aggressively re-assess homes that are recently purchased while others do not. Taking the example of a 5% tax rate on a \$200,000 home again, if the home was previously assessed at \$40,000 and is not re-assessed, the homeowner only owes \$167 per month in taxes. This gap of over \$600 depending on a reassessment is a critical factor when purchasing a home, and the inconsistency in reassessment can make decisions about buying homes in specific municipalities tricky.

In this project, I aim to help prospective homeowners in Allegheny County more accurately estimate their potential property taxes. To do this, I plan to:

1. Provide an estimate on whether or not someone will likely be re-assessed based on a variety of factors including municipality, school district, purchase price, and difference between the purchase price and the current property assessment
2. Provide a rough estimate on what a reassessment would likely value their home at in terms of a purchase price.

ii. Data

The data for this project will primarily come from data repositories that Allegheny County maintains and makes free to the public. Three primary sources I’m using are:

1. [Property Sales Transactions](#) – Data on real estate sales from 2013 – present.
2. [Property Assessments](#) – Details on property locations and assessments.
3. [Property Assessment Appeals](#) – Details on which properties were appealed.

I’ve already done some preliminary exploration, and these sources together already allow me to gauge what property appeal rates tend to be by county. In addition to these sources, I’m also using the [county school district and municipality tax rates](#) to be included in my calculations and predictions. As a stretch goal, I’m finally considering joining this data set to external data like [Niche.com school district grades](#) or census data to understand if reassessment rates are higher for specific school districts.

Finally, it’s worth noting that I’m planning to limit my data collection from 2015-2020. In initial data exploration, it seems rare for a property to be reassessed before a two year period, so including data from the last two years would likely underestimate reassessments.

iii. Research Questions and Methods

I'm planning to use a variety of classification techniques to try and predict whether a re-assessment would be likely to occur for a given property. These include:

- Logistic Regression
- SVM
- KNN
- Naïve Bayesian Classification

For the component of the project where I try and predict an actual assessment value, I am planning to test a variety of linear regression models. In all the methods above, I plan to identify the best method through cross-validation. For the classifiers, the cross-validation KPI will be minimizing misclassification rate, and for linear regression it will be minimizing MSE. Note that for classification techniques where it makes sense, I will appropriately use scaling and/or standardization.

iv. Conclusion

I feel confident that the data and research methods above will allow me to create an approach that will help prospective homeowners more accurately gauge their likelihood to be reassessed on a home purchase.

ⁱ <https://www.hrblock.com/tax-center/filing/states/pennsylvania-property-tax/>

ⁱⁱ Assessed values should technically be divided by the 'common level ratio' for the given county as seen on this page. <https://www.revenue.pa.gov/TaxTypes/RTT/Pages/Common%20Level%20Ratios.aspx>