Statistical Analysis of PARC Near West Side Identifying Zombie Properties

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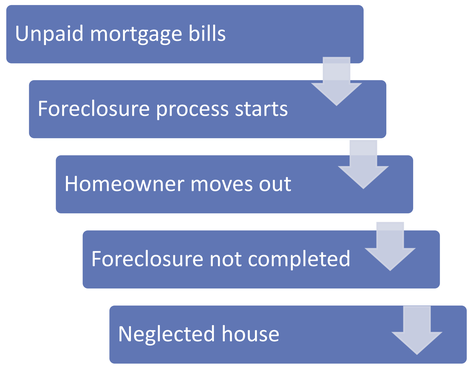
Objective

- Identify potential zombie properties in the Near West Side using data science techniques and data collected by PARC
- Quantify impact of zombie properties on its neighborhood using a linear regression model

Background

- "A zombie title is a real estate title that has stayed with the owner of a residential property after the mortgage lender has begun a foreclosure process (making the owner believe that the owner no longer owns) but then the lender does not finish the foreclosure process – thus leaving title in zombie (limbo) status."[1]



- Signs that a property might be a zombie:
  - Maintenance is not taken care of
  - Lawns are not mowed
  - Sidewalks are not shoveled when it snows
  - Broken windows
  - Thieves stealing the piping, wiring, sometimes even appliances in the property
  - Squatters may occupy the dwelling
- **P**romoting **A**ssets **R**educing **C**rime (**PARC)** is a non-profit organization in Milwaukee funded by Marquette University, Aurora Health Care, Harley-Davidson, MillerCoors and Potawatomi Business Development Corporation
- **Near West Side** is a neighborhood of City of Milwaukee neighborhoods: Martin Drive, Miller Valley, Cold Spring Park, Concordia, The Valley/Pigsville, Merrill Park, and Avenues West

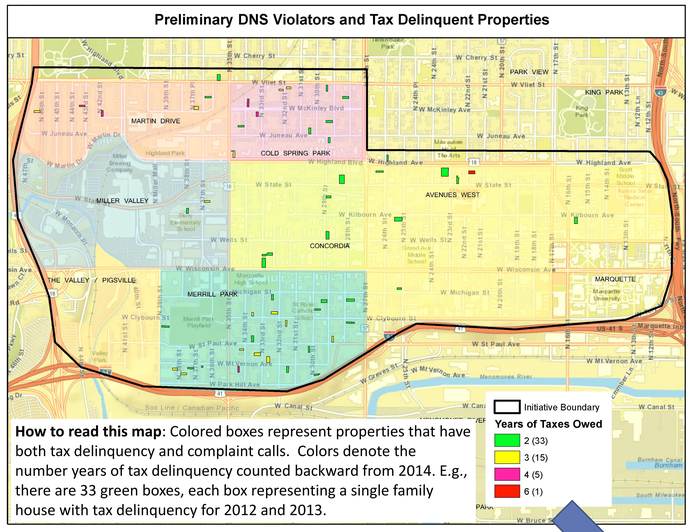
Methods and Materials

To identify candidate zombie properties by data science techniques:

- Locate relevant data sets, analyze its metadata, and clean the data sets
- Use various software suites (GIS, statistics and other data analysis tools) to combine data sets and study using preliminary models. In particular, combine filtered complaint calls to Milwaukee Department of Neighborhood Services (DNS) in 2013 and 2014 with Milwaukee Tax Delinquent data to create candidate zombie properties in Milwaukee
  - **DNS complaint call types used:** code compliance, condemnation, exterior/interior maintenance, garbage, graffiti, nuisance, and vacant building
- To get candidate zombie properties only in Near West Side, filter using parcel taxkey and place them on a map
- With these candidate zombie properties, on the map we use 1/8 of mile distance from these candidates to look at single family housing sale prices in 2010-2015
- Using a regression model, compare single family housing sale price with properties that are not near candidates zombie properties (outside of 1/8 of mile from candidates) with Martin Drive as our base neighborhood and 2010 as our base year

Results

Figure 1. Candidate zombie properties in Near West Side



How to read this map: Colored boxes represent properties that have both tax delinquency and complaint calls. Colors denote the number years of tax delinquency counted backward from 2014. E.g., there are 33 green boxes, each box representing a single family house with tax delinquency for 2012 and 2013.

Chart 1. Single family housing sale prices in Near West side by years

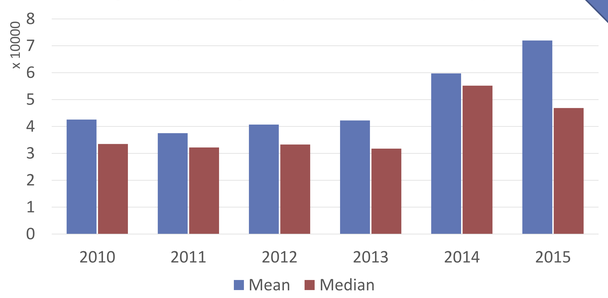


Table 1. Regression table for single family housing sale price

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.683501	0.255506	37.89927	0.0000
IN_RANGE	**-0.316733**	0.125182	-2.530173	0.0122
NUM2011	-0.349478	0.164836	-2.120152	0.0353
NUM2012	-0.070363	0.191758	-0.366938	0.7141
NUM2013	0.058916	0.164742	0.357625	0.7210
NUM2014	0.009778	0.163359	0.059854	0.9523
NUM2015	0.074466	0.152126	0.489504	0.6250
AVENUES_WEST	-0.339806	0.202198	-1.680561	0.0945
MERRILL_PARK	-0.452413	0.178459	-2.535107	0.0120
MILLER_VALLEY	0.005050	0.310795	0.016248	0.9871
CONCORDIA	-0.288780	0.187949	-1.536482	0.1260
COLD_SPRING_PARK	-0.410094	0.202052	-2.029647	0.0438
THE_VALLEY_PIGSVILLE	-0.042621	0.250577	-0.170092	0.8651
BEDROOM__S	0.170052	0.039426	4.313196	0.0000
FULL_BATHROOM__S	0.185186	0.089455	2.070158	0.0398
HALF_BATHROOM__S	0.294782	0.100094	2.945052	0.0036
GARAGE_SPA	0.087780	0.077117	1.138267	0.2564
GARAGE	0.306170	0.166918	1.834254	0.0681
ATTACHED	0.007986	0.238092	0.033542	0.9733
R-squared	0.416769	Mean dependent var		10.48609
Adjusted R-squared	0.362655	S.D. dependent var		0.889463
S.E. of regression	0.710093	Akaike info criterion		2.238129
Sum squared resid	97.82112	Schwarz criterion		2.537963
Log likelihood	-219.3608	Hannan-Quinn criter.		2.359302
F-statistic	7.701650	Durbin-Watson stat		2.034723
Prob(F-statistic)	0.000000			

Table 2. Amount of tax owed by years of delinquency

Years of taxes owed(Number of properties)	Tax Owed
2(33)	$416,617
3(15)	$210,346
4(5)	$88,169
6(1)	$26,353
Total owed (54)	$741,485

Discussion

- In the tax delinquency data set, we do not use one year delinquency data (we treat one year tax delinquency as a grace period)
- Each neighborhood has different characteristics which made it harder to compare single family housing sale prices to each other
- Data sets are incomplete; lack square footage of bedrooms, bathrooms and lot in some of our data. Our model for single family sale price uses the number of bedrooms, bathrooms and garage (also, if the property has a garage or not)
- Looking at the number under coefficient in table 1 will tell the percentage change in price of single family properties
- With everything else constant, the regression suggests that properties near candidate zombie properties sell at a price about **31.67%** lower than properties that were outside of 1/8 mile from our candidate zombie properties. Our model was able to predict 41.68% of the variance in single family housing sale price

Conclusions

- We were able to combine complaint calls to Department of Neighborhood Services in 2013 and 2014 with tax delinquency data from 2014 to determine reasonable numbers of zombie candidates for a certain time period
- We were able to use a regression model to provide a preliminary estimate of the quantitative impact of a [candidate] zombie property upon neighborhood single family housing property sale prices

Future Directions

- Use more indicators to narrow down candidates of zombie properties (e.g., foreclosure data)
- Audit candidate zombie properties (i.e., physically visit the properties)
- Combine master property data and assessment data with our single family housing price to accurate impact of zombie properties
- Using similar regression model for CAD (Computer-Aid Dispatch) calls in the Near West Side

Contact Information

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Acknowledgements

All work done was at Marquette University funded by National Science Foundation (NSF Award ACI-1461264). Special thanks to Dr. Gary Krenz for his mentorship and Pat Kennelly and Marc Hasan for providing access to PARC data sets and their insights throughout the Research Experience for Undergraduates (REU) as well as Dr. Dennis Brylow and Dr. Kim Factor for organizing the program.

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