

Extracting Land Prices from Single-Family Residential Sales Data

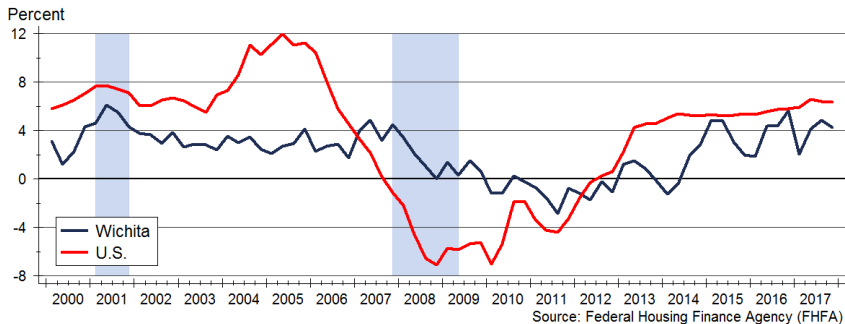
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HOMER HOYT INSTITUTE/WEIMER SCHOOL OF ADVANCED STUDIES
PROGRAM ON REAL ESTATE MARKET VOLATILITY

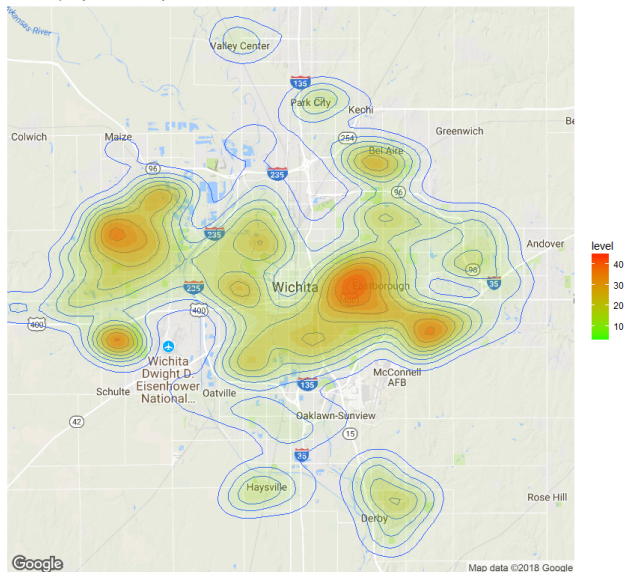
MAY 18th-19th, 2018

House Price Dynamics in Wichita



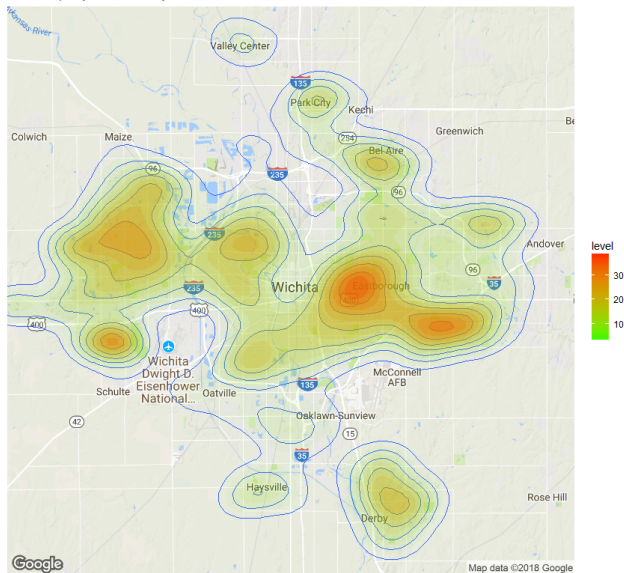
Stability: House Sale Density 2004-05

SFR Property Sale Density Surface - 2004 to 2005



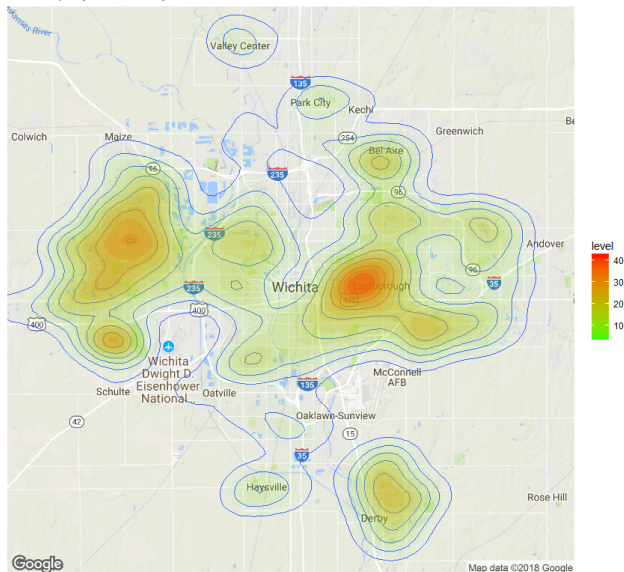
Stability: House Sale Density 2008-09

SFR Property Sale Density Surface - 2008 to 2009



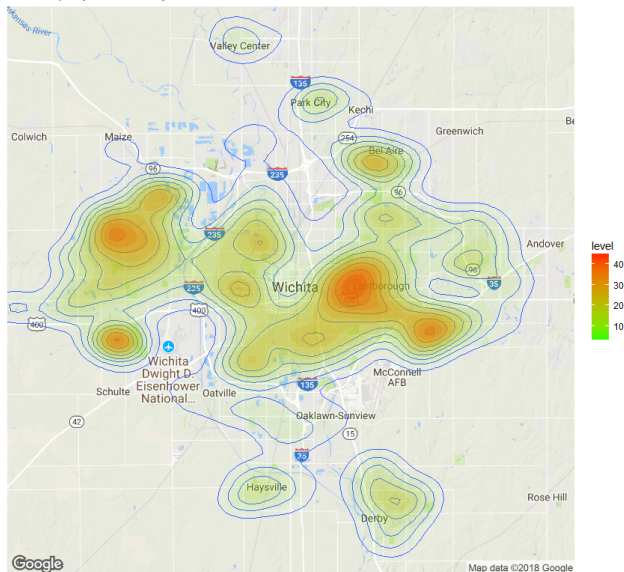
Stability: House Sale Density 2015-16

SFR Property Sale Density Surface - 2015 to 2016

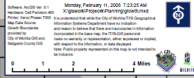


Stability: House Sale Density 2004-05

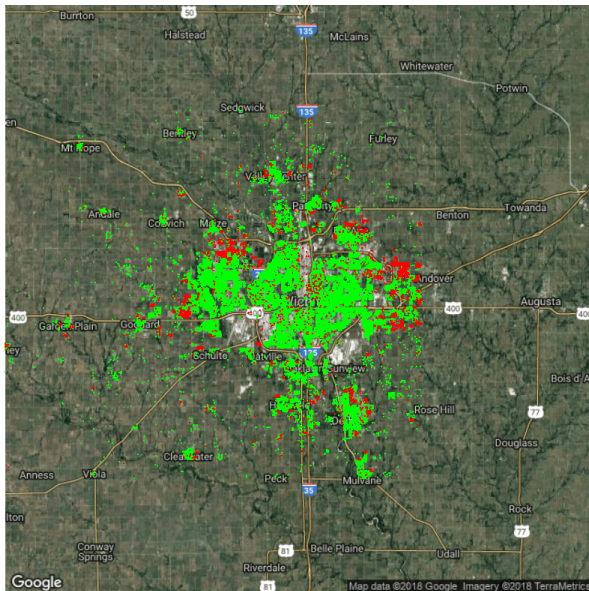
SFR Property Sale Density Surface - 2004 to 2005



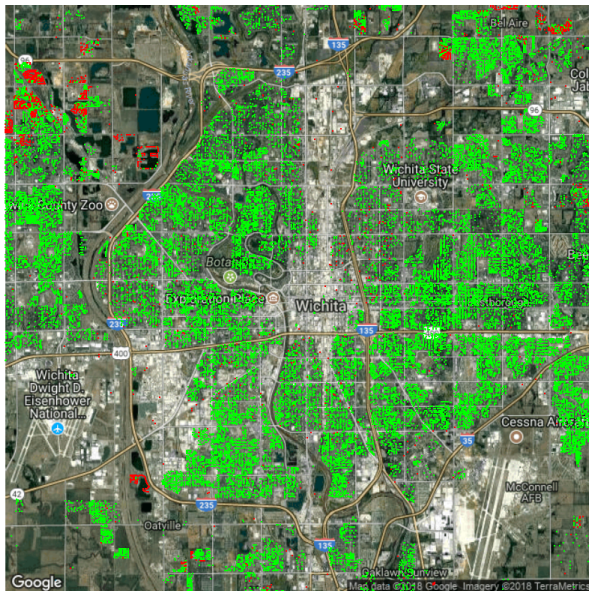
City of Wichita



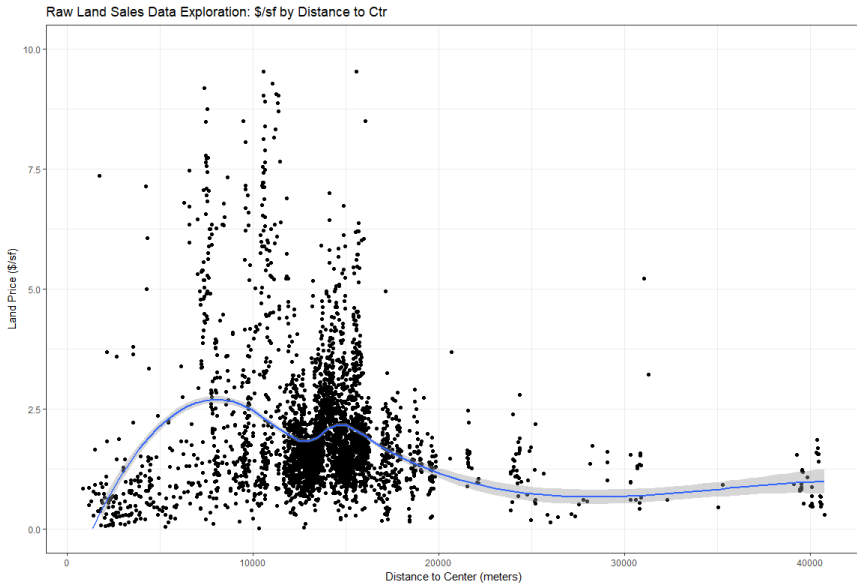
Sales Data - Metropolitan Wichita



Sales Data - Downtown Wichita



Measuring Land from Land Sales



From SFR to Land Prices

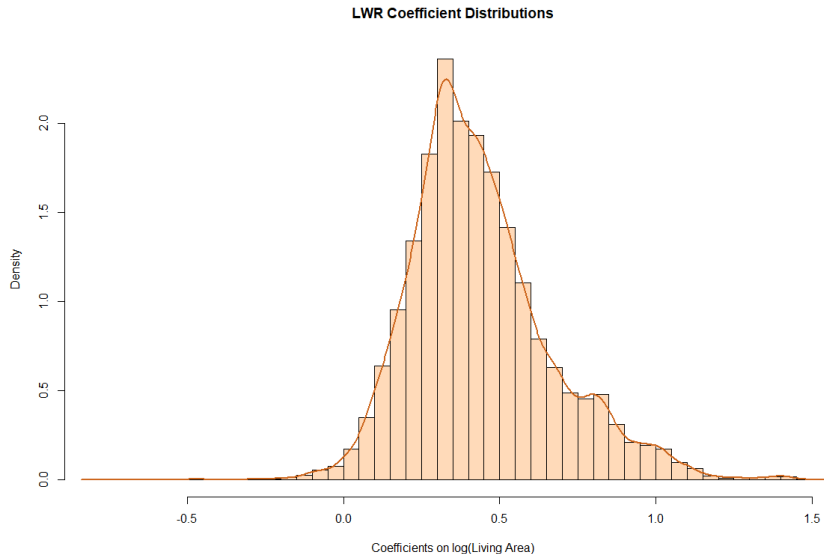
An overview of the process

- $P = B + L$
 - We observe P , but not B or L
 - Moreover, B and L are heterogeneous
 - We can see P and want L , so we need to estimate B
- Strategy:
 - Estimate implicit prices for each dwelling using LWR
 - Calculate the “standard” dwelling for Wichita
 - Use this standard dwelling at each house, by using the median attributes everywhere, but using the spatial prices from the LWR
- These dwellings would be standard and offer a standard price surface of the bundled L and B
- Estimate \hat{B} using land sales and \hat{P}
- Subtract \hat{B} from \hat{P} to calculate \hat{L}

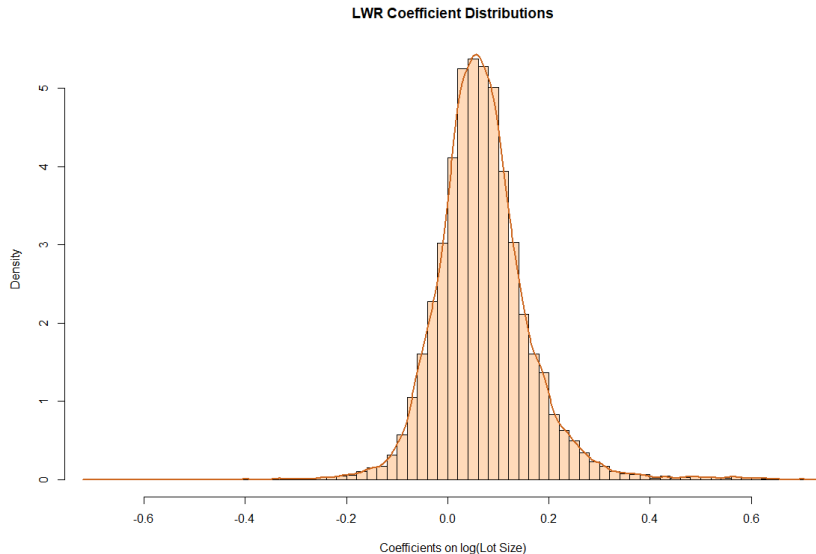
Estimating Land Prices from SFR/Land Sales

- Locally-weighted regressions are linear hedonics of
 - $\ln(\text{price}) =$
 $\ln(sf) + \ln(\text{lot}) + \ln(\text{age}) + \text{beds} + \text{baths} + \text{basement} + \text{quality} + \text{cdu} + D_t$
 - Window: 150 nearest units
 - Kernel: tri-cubic of “distance” $[f(x, y, sf, \text{beds})]$
- The standard unit is
 - 1,372 sf, 9805 sf lot, no basement, 3 bedrooms, 3 baths, 29 years old, with moderate quality
 - The standard unit varies by the three eras we looked at: 2004-05, 2008-09, and 2015-16

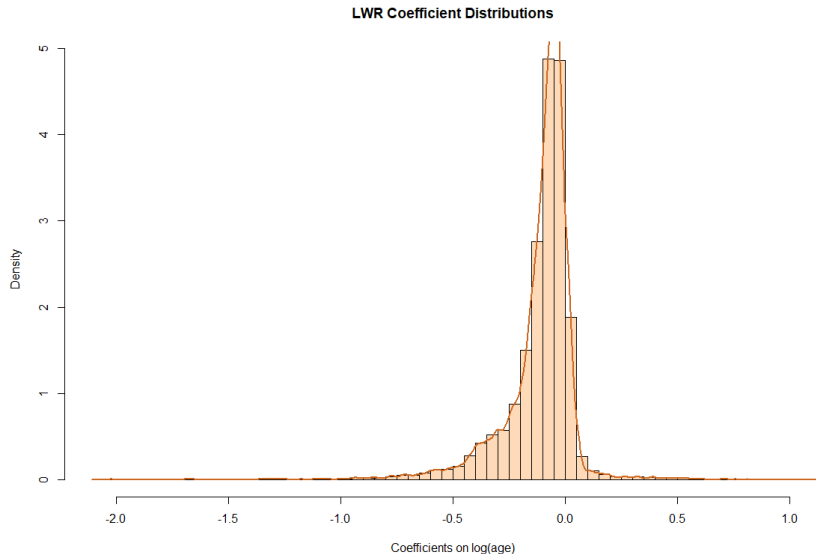
Locally Weighted Regression Coeffs



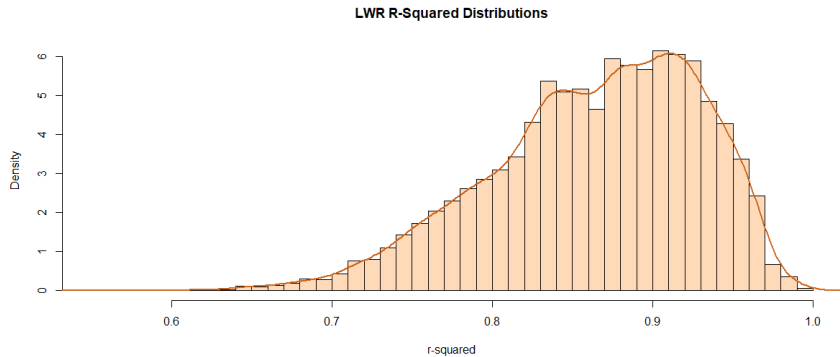
Locally Weighted Regressions Coeffs



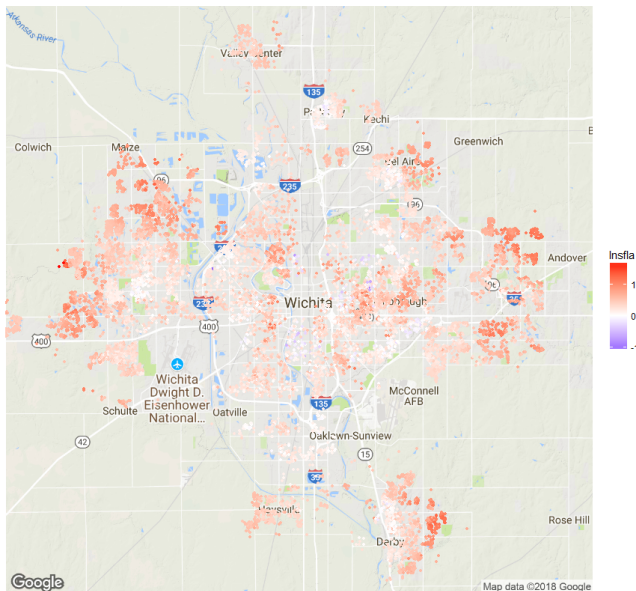
Locally Weighted Regression Coeffs



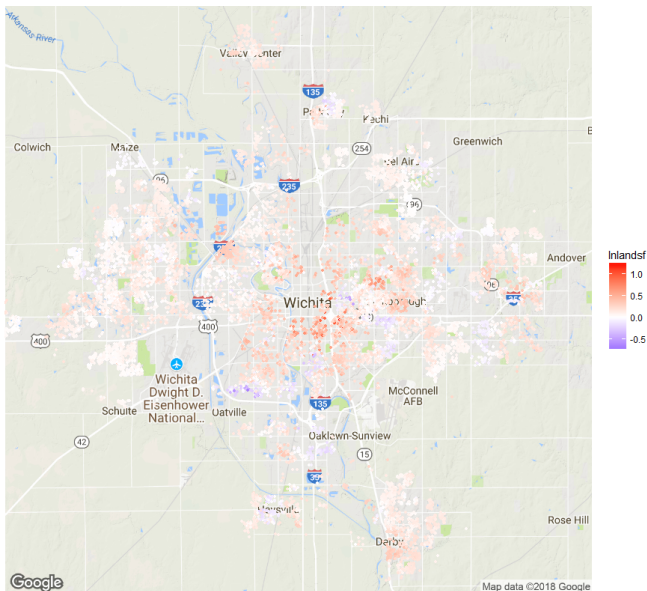
Locally Weighted Regression Coeffs



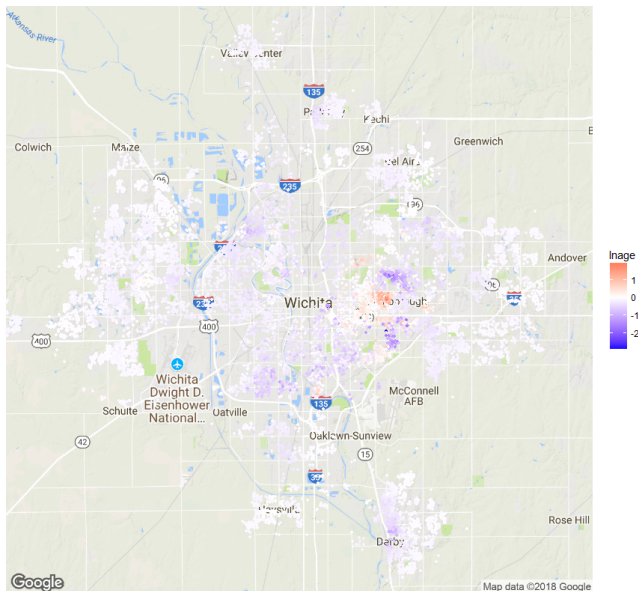
Locally Weighted Regression Coeffs - Living Area



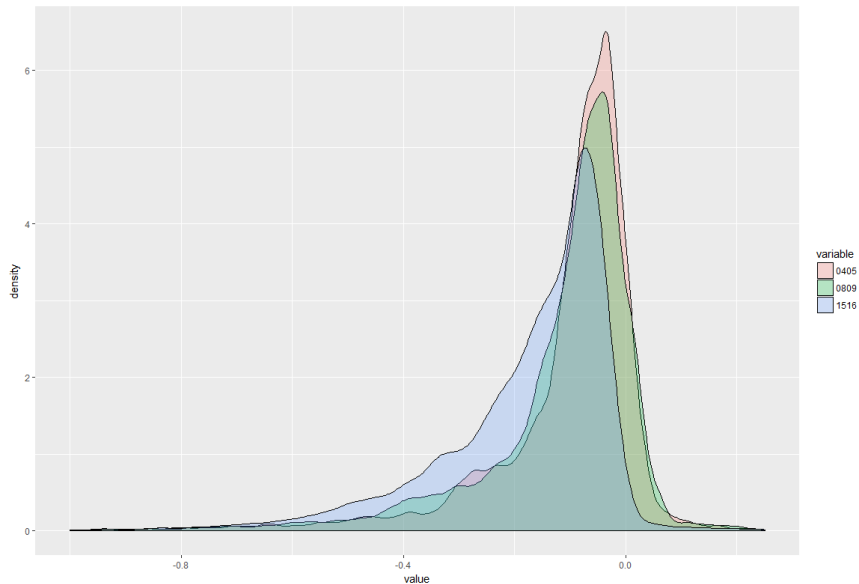
Locally Weighted Regression Coeffs - Lot Size



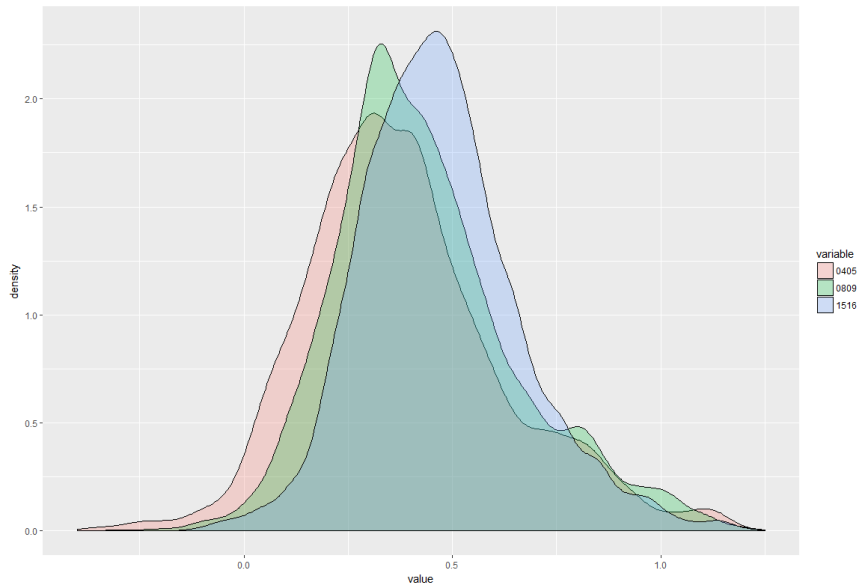
Locally Weighted Regression Coeffs - Age



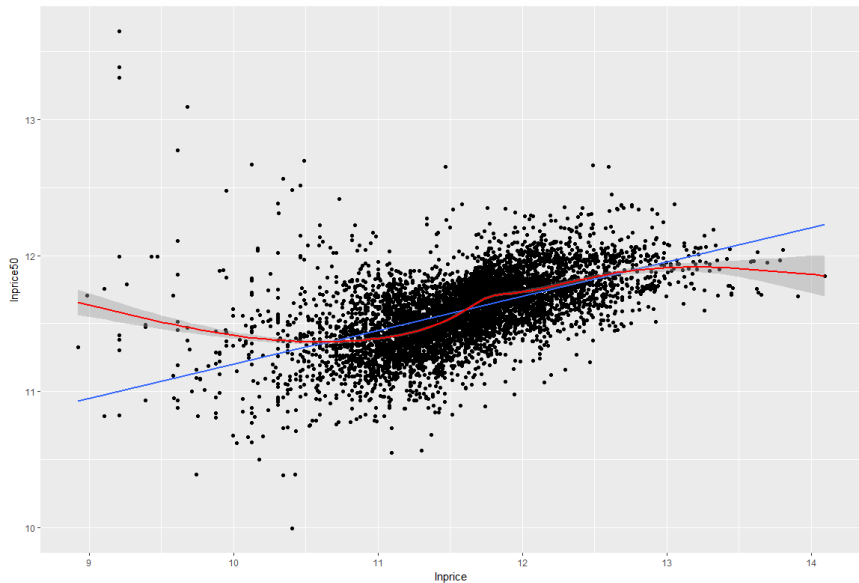
Locally Weighted Regression Coeffs - Age



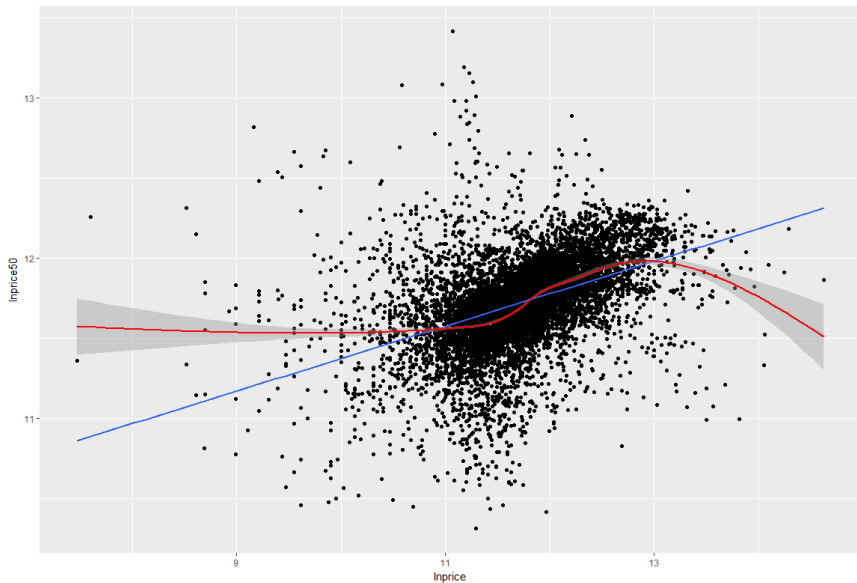
Locally Weighted Regression Coeffs - Living Area



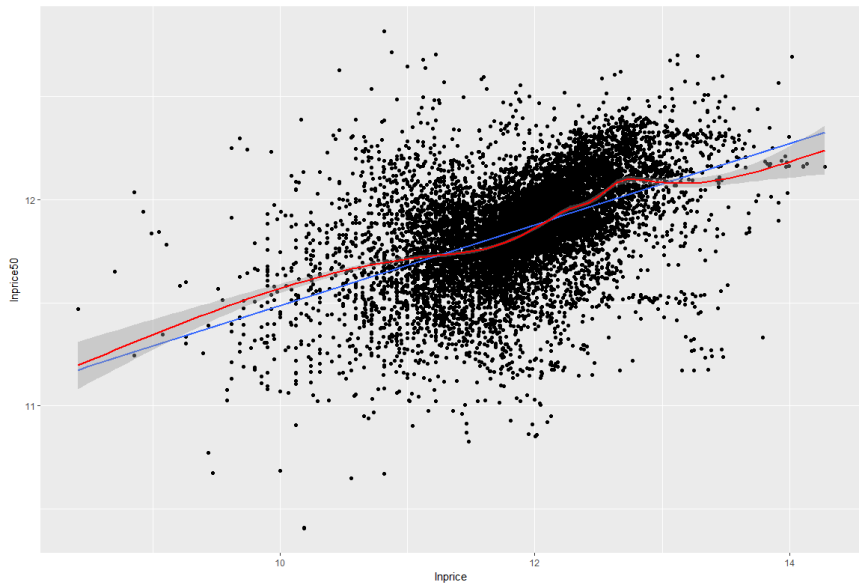
Standard v. Actual Property Price - 2004-05



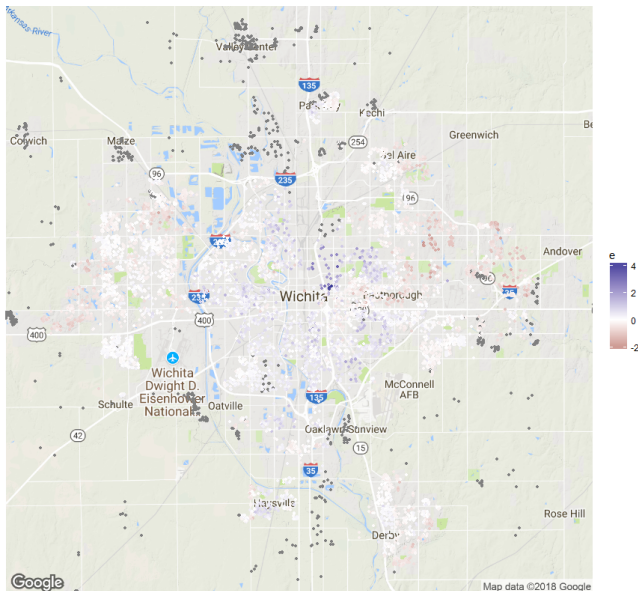
Standard v. Actual Property Price - 2008-09



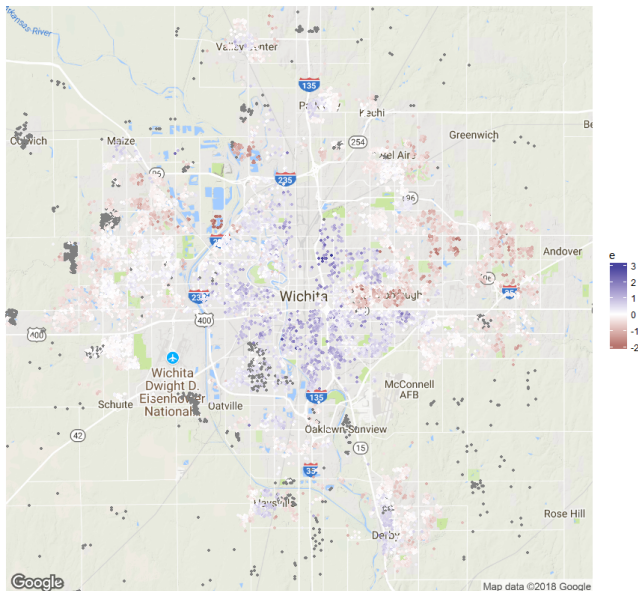
Standard v. Actual Property Price - 2015-16



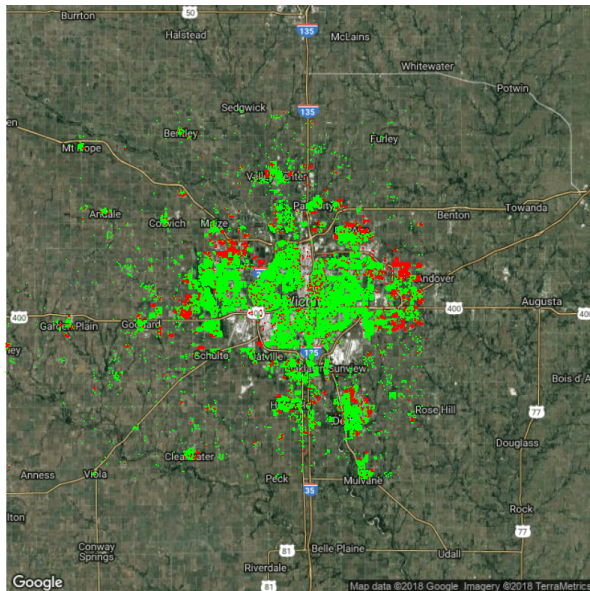
Standard minus Actual Property Price - 2004-05



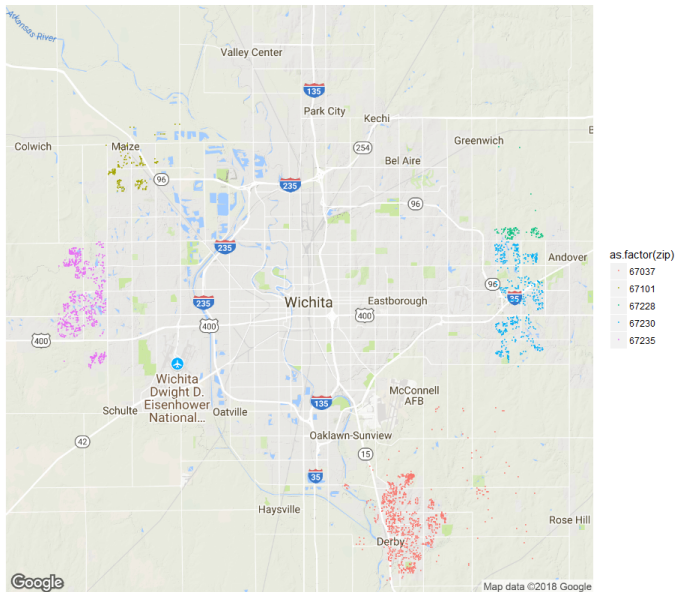
Standard minus Actual Property Price - 2015-16



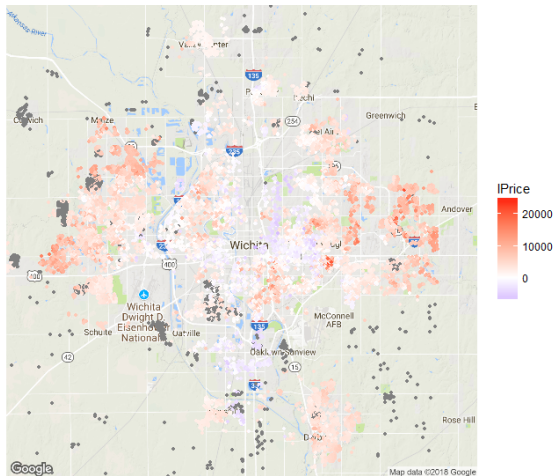
Sales Data - Metropolitan Wichita



Land Sale “Tie Down Points”



Estimated Land Price Surface 2015-2016



Review of step/Results

- We know it's important to understand land prices
- We also know measuring land prices is difficult
- Our approach:
 - Makes use of land sales bundled with home sales
 - Finds significance spatial and temporal variation in both structures and how they are priced
 - Attempts to hold constant both to establish a constant quality structure, and allowing a land price surface to be estimated.
- We find:
 - the most expensive residential land is not in the city center
 - rather, the most valuable residential land is in pockets beyond the center
 - There is a general downward sloping gradient, but distance to the CBD alone does not explain the spatial variation variation in land prices well

Next steps

The laundry list of extensions

- The LWR has proven robust thus far, but more is needed
- The local coefficients are equally weighted
- The land and property regressions are estimated separately
- The data is specific to SFR
- The data are pooled locally in a rather blunt way
- The standard house can be out of sample in some neighborhoods
- ...and more...

Thank you.