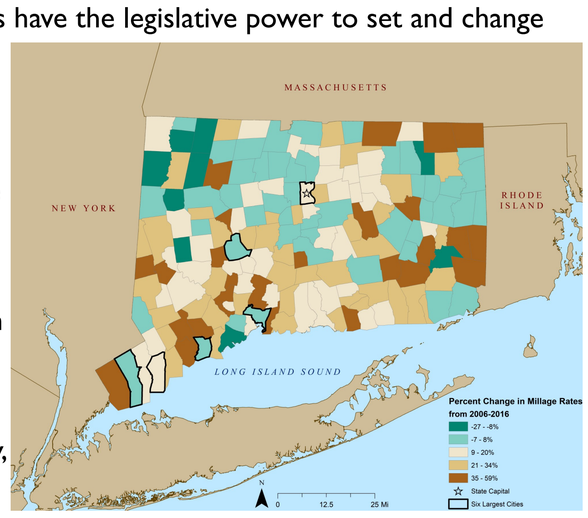
WHEN RATES DEVIATE

Examining Millage Rates in Connecticut

A Source of Revenue

Property taxes are collected by local governments to generate revenue. Property taxes consist of the assessed value of the property and a millage rate. A millage (mill) rate represents the amount per $1,000 of the assessed value of the property. Local governments have the legislative power to set and change their millage rates. Many municipalities operate under the assumption that millage rates should be lower in places that have higher property values. Additionally, local governments argue that places with lower property values need to have high millage rates to offset the difference in property tax collected by each household.



States like Massachusetts and California have implemented statues that have limited their municipality's power in setting millage rates. Policy and planning officials are beginning to understand that property values are not strictly a function of assessed property value. It is important for government officials to examine which municipalities deviate from the property tax equation, by how much, and the spatial relationship of these places. By examining the spatial relationship of millage rates and property values in Connecticut, policy makers and planners can discuss ways to make property taxes more equitable.

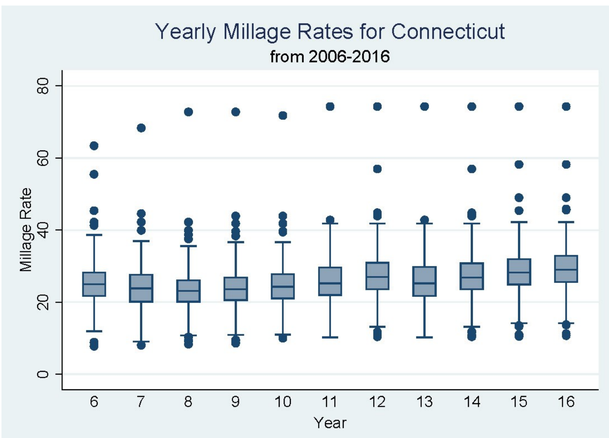
This project aims to :

- **Illuminate** the emerging spatial patterns of millage rates and property values in Connecticut from 2006-2016.
- **Determine** how well property value predicts millage rates in Connecticut.
- **Examine** if there are spatial patterns to the deviations in the predictions of millage rates.

Methods

The methods for this research project were two-fold. To understand the emerging spatial patterns, a Global Moran's I was run on yearly millage rate data from 2006-2016. Each year's results had a *statistically significant p-value* and a *positive Moran's I index value*, indicating a tendency towards clustering of the data. Next, space-time cubes were created for both millage rate and property value data. When creating the space-time cubes, the millage rate and property value were included as summary fields that would calculate the mean of each year for each town. Both time cubes were then used to run hot spot analyses for the variables. The time interval used was one year for both millage rates and property values.

To determine how well property value predicted millage rate, an ordinary least squares (OLS) regression was run. Yearly property values were available for 2007-2015 from the American Community Survey. The regression was created using 2007-2014 property value data so the predicted values could be compared to the observed values in 2015. The box plot shows the distribution of millage rates for the State of Connecticut by year. The regression equation is **Mill Rate = 158.50 – 10.55 * ln(Home Value).**

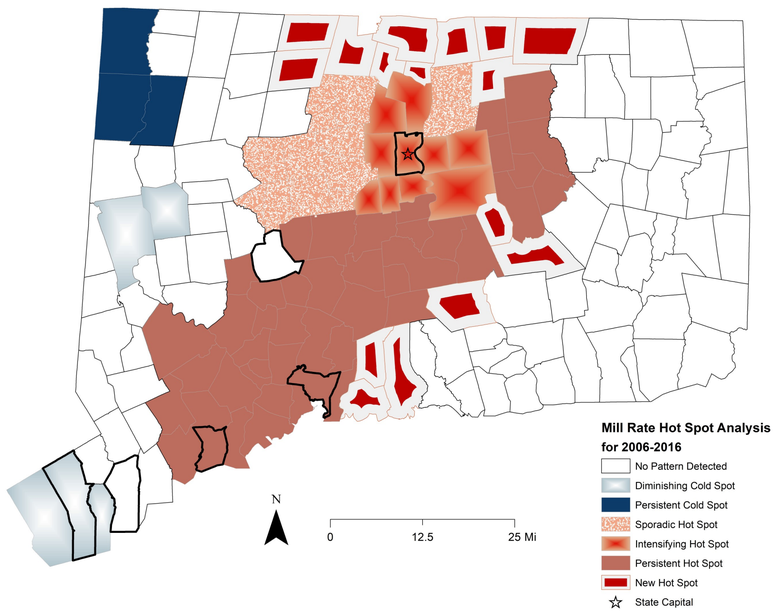


Results

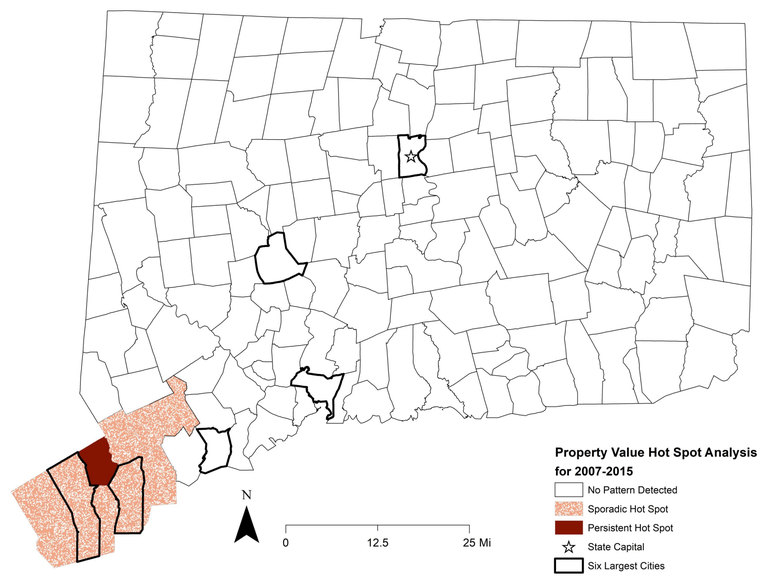
Part I.

Examining the spatial patterns of Millage Rates from 2006-2016 & Property Values from 2007-2015 through Hot Spot Analyses.

Millage Rate Hot Spot Analysis



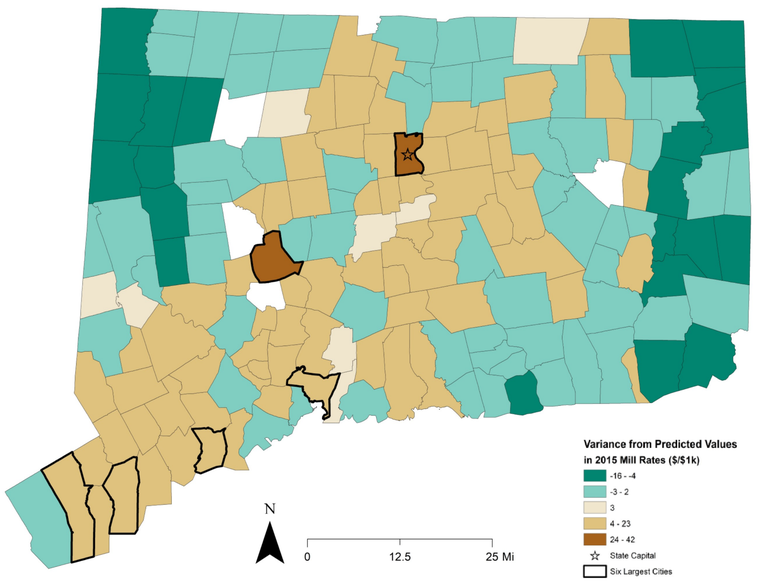
Property Value Hot Spot Analysis



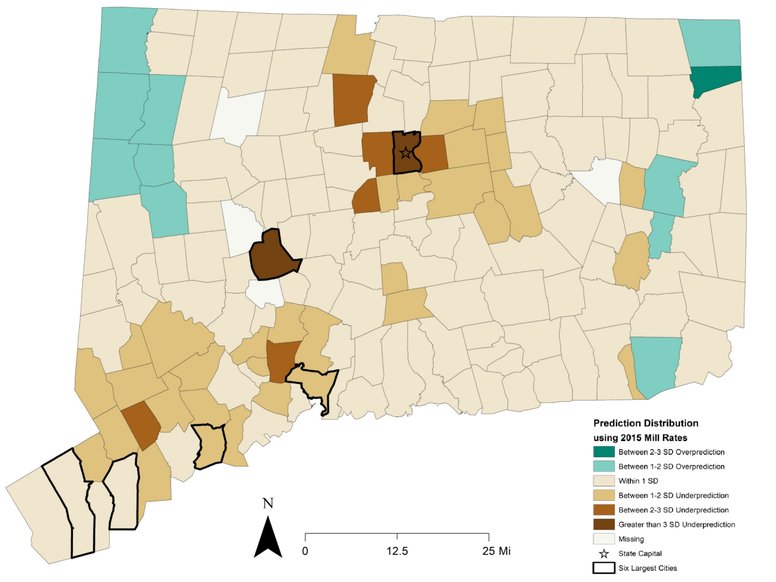
Part II.

Examining how well property values predict millage rates through an Ordinary Least Squares (OLS) Regression.

Millage Rate Variance from Predicted Values



Millage Rate Prediction Distribution



Discussion

There were five patterns detected throughout the hot spot analyses. A **Diminishing Cold Spot** represents a town that has been a statistically significant cold spot for 90% of the one-year intervals, including the final year. A **Persistent Cold/Hot Spot** represents a town that has been statistically significant cold/hot spot for 90% of the one-year intervals with no discernable trend indicating an increase/decrease in the intensity of the clustering over time. A **Sporadic Hot Spot** is a town with on-again and off-again hot spots. Less than 90% of the one-year intervals have been statistically significant hot spots, and none of the one-year intervals are statistically significant cold spots. An **Intensifying Hot Spot** is a town that has been a statistically significant hot spot for 90% of the one-year intervals, including the final year. A **New Hot Spot** is a town that has a statistically significant hot spot for the final year and has never been a statistically significant hot spot before.

For the Millage Rate Hot Spot analysis, 49.7% (84/169 towns) are either new hot spots, persistent hot spots, sporadic hot spots, or intensifying hot spots. Out of the eighty-four, twelve towns are sporadic hot spots and sixteen towns are new hot spots. This means for 33% of the state, the millage rates from 2006-2016 have been statistically significant 90% of the years. Connecticut has been in an economic hardship for many years, and the increasing/persistent millage rates throughout the state illuminate that local towns are having to raise their millage rates to generate sufficient revenue.

When examining the Property Value Hot Spot Analysis, nine municipalities show a spatial pattern in median home value from 2007-2015. A closer look reveals that a pattern can be seen: the towns with average median home values below $1M have millage rates 4.18-9.45 greater than Westport, one of the towns with an average median home value above $1M and the highest millage rate.

A Closer Look: Property Values and Mill Rates in Southwest CT

Town	Average Mill Rate (2006-2016)	Average Median Home Value (2007-2015)	Hot Spot Classification
Norwalk	22.05	$438,311.11	Sporadic Hot Spot
Stamford	20.80	$534,300.00	Sporadic Hot Spot
Easton	26.07	$689,388.89	Sporadic Hot Spot
Wilton	22.87	$833,811.11	Sporadic Hot Spot
Weston	24.70	$899,200.00	Sporadic Hot Spot
Westport	16.62	$1,031,289.56	Sporadic Hot Spot
Greenwich	9.74	$1,065,889.56	Sporadic Hot Spot
Darien	13.25	$1,102,967.33	Sporadic Hot Spot
New Canaan	14.48	$1,127,189.56	Persistent Hot Spot

Overall, the regression illustrated that property value is not the only explanatory variable of millage rate. When the regression is examined in context with the six largest cities in Connecticut, one can see that the millage rates in Hartford and Waterbury are not accurately predicted by median home value, which were under-predicted by three standard deviations. For the other largest cities, the regression under-predicted the millage rates by two standard deviations.

The Prediction Distribution in Connecticut's Six Largest Cities

Town	2015 Millage Rate	Predicted Millage Rate	Variance from Predicted Values	2015 Median Home Value	Prediction Distribution
Stamford	24.79	19.70	5.09	$516,000	Within 1 Standard Deviation
Norwalk	25.04	21.82	3.22	$421,900	Within 1 Standard Deviation
New Haven	41.55	30.27	11.28	$189,400	Between 1-2 SD Under-prediction
Bridgeport	42.20	31.39	10.81	$170,300	Between 1-2 SD Under-prediction
Waterbury	58.22	34.36	23.86	$128,600	Greater than 3 SD Under-prediction
Hartford	74.29	31.90	42.39	$162,300	Greater than 3 SD Under-Prediction

Limitations and Future Research

There were three main limitations to this research project. First, when calculating neighbors in the hot spot analysis, the centroid of each town was used rather than a distance. Municipalities vary in size, so setting a determined neighbor distance would not have enhanced this research. Second, 5-year estimates for Median Home Value of Owner-Occupied units were used as a proxy for yearly estimates. The middle year of the 5-year estimate was chosen to represent a year in time. Lastly, the regression does not account for confounding factors. The next steps of this research project will be to re-examine this project in Spatial Statistics, accounting for other factors such as population size, race, and income.

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GIS 0102; Advanced GIS; Spring 2019

Projection NAD 1983 StatePlane Connecticut (Feet) Lambert Conformal Conic

Data Sources ESRI, UConn MAGIC Department, US Census Bureau, CT Office of Policy & Management

Image Sources http://www.freestockphotos.biz/stockphoto/14425 (House) https://www.onlinewebfonts.com/icon/458000 (Money)