AN ANALYSIS OF CONNECTICUT PROPERTY APPRAISAL ACCURACY

WESTERN CONNECTICUT COUNCIL OF GOVERNMENTS

EXECUTIVE SUMMARY

This report provides an analysis of property appraisal accuracy in Connecticut by comparing the sales price of properties sold between 2011 and 2014 with their appraised value. We find that appraisals tend to be more accurate as the value of a property increases. In particular, appraisals of medium- and high-value properties are typically within 3% of true market value, while appraisers overestimate the value of low-value properties, often by upwards of 30%. This represents a substantial additional tax burden for owners of low-value properties. In addition, we find that wealthier towns tend to have more accurate and less biased appraisals.

1. INTRODUCTION

In the state of Connecticut, property taxes are are the main source of revenue for local governments, the largest tax paid by state residents, and the basis for distributing state funds[1]. To determine an individual's property tax liability, the town first appraises the value of their property (by law, revaluations occur every 5 years)[2]. The appraised value is then multiplied by an assessment ratio—generally 70%—to obtain the assessed value. Finally, the assessed value is divided by 1000 and multiplied by the mill rate, which varies greatly but generally lies between 20 and 40.

The purpose of this paper is to analyze property sales in Connecticut between 2011-2014 and compare each property's sales price, which represents its true market value, with its appraised value. We focus this study on how appraisal accuracy differs across properties of different values, and how these differences impact tax equity. Additionally, we analyze appraisal patterns across the state's 169 municipalities.

2. METHODOLOGY

The data set which formed the basis of this analysis is the "Real Estate Sales by Town for 2011-2014" released by the Connecticut Office of Policy and Management. Only sales of residential and apartment properties marked as "usable" were considered. Appraised values were calculated from assessed values using an assessment ratio of 32% for residential properties in Hartford and 70% for everything else. In total, there were approximately 117000 data points.

[1] "Connecticut Tax Incidence," *Connecticut Department of Revenue Services*, Dec. 2014

[2] "Property Tax Revaluation," *Connecticut Office of Legislative Research*, Feb. 2012

2.1. **Appraisal Accuracy.** In this paper, a property was categorized as "low-value" if its sale price was in the bottom 25% of sale prices statewide, "high-value" if it was in the top 25%, and "medium-value" otherwise. The cutoff prices for low-value and high-value properties were $145000 and $385000, respectively. The "appraisal difference" (AD) refers to the appraised value minus the sale price. This difference is positive for an over-appraisal and negative for an under-appraisal. The "normalized appraisal difference" (NAD) is the appraisal difference as a proportion of the property's sale price. We calculated both AD and NAD for every property before finding the median values in every property category. Additionally, we estimated the impact of these differences on the properties' tax payments between 2011 and 2014.

Finally, to more carefully explore how appraisal accuracy is affected by property value, we grouped the properties based on sale price. These groups contain homes with sale prices within a $5000 range. For each group, we calculated the median appraisal difference, and then plotted these appraisal differences against the median property value within each group.

2.2. **Town Analysis.** To assess the each town's individual appraisal accuracy, the median appraisal difference for each of the 169 municipalities was calculated. These differences were plotted against the median sale price of all properties within the town in order to determine if there is a relationship between a town's overall wealth and the accuracy of its appraisals.

For each town we also calculated the appraisal bias against low-value properties. To do so, we first found the median normalized appraisal difference for both properties in the top quarter and bottom quarter of each town[3]. The high-value NAD was then subtracted from the low-value NAD. Positive values indicate that, relative to how high-value properties are appraised, low-value properties are overestimated; negative values indicate the opposite. The appraisal bias is also plotted against median property sale price.

2.3. **Last Revaluation Date.** The properties included in this analysis, depending on town, were all re-appraised sometime between 2010 and 2014. We recognize that revaluation dates often impact the accuracy of housing appraisals, since property values shift over time. However, these differences do not seem to impact the results of this analysis. In Appendix A, we have included a probability density plot of appraisal difference for each revaluation year. Overlaying these plots reveals that appraisal accuracy every year adheres very closely to the overall trend, indicating that between 2010 and 2014 there were no systemic changes to appraisal accuracy. Furthermore, we have analyzed each of the graphs in this paper on a year-by-year basis, and are confident that no patterns arising from revaluation date exist.

3. RESULTS

3.1. **Appraisal Accuracy.** Table 1 summarizes the results of the analysis. AD refers to appraisal difference and NAD refers to the normalized appraisal difference. Full histograms of AD for each property group are provided in Appendix B.

[3]Town-specific cutoffs were used rather than the state-wide ones because properties are often compared relative to other properties in the town during the appraisal process.

TABLE 1. Summary of Appraisal Accuracy Analysis

Group	Median AD	Median NAD	Est. Tax Impact
Low-value	+36846.43	+36.304%	+255587193
Medium-value	+5571.43	+2.206%	+73733176
High-value	-23692.86	-2.314%	-130720473
All properties	+11285.71	+2.863%	+198599896

In Figure 1 property sales price is plotted against the median appraisal difference for all properties within a $5000-range of the plotted price.

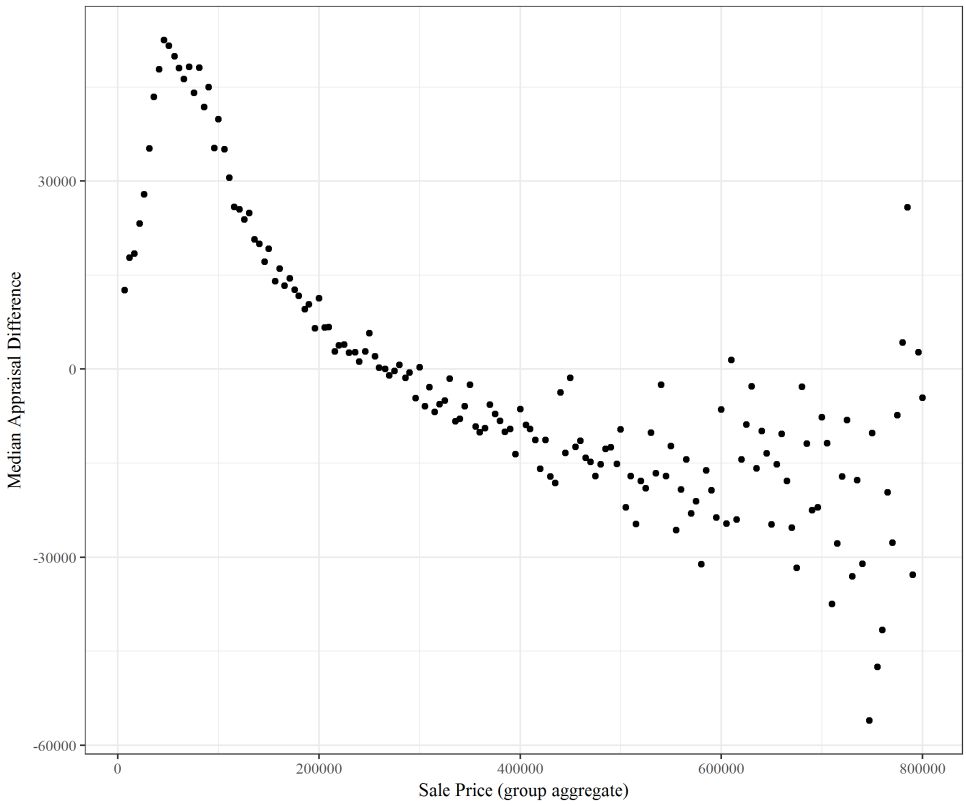


FIGURE 1. Sale Price vs. Appraisal Difference

Notice the decrease throughout, indicating that appraisals become steadily more favorable as home value increases. The significant increase in spread at the upper end of the graph reflects both a decline in the number of properties in each group and the added difficulty of accurately appraising homes with unique, high-end features. Note that this graph shows appraisal difference in absolute dollar amount. The downwards movement becomes more pronounced if the appraisal difference is taken as a proportion of sale price.

3.2. **Town Analysis.** In Figure 2, the median sale price for every town is plotted against its median normalized appraisal difference. The plot suggests a moderate relationship between wealthier

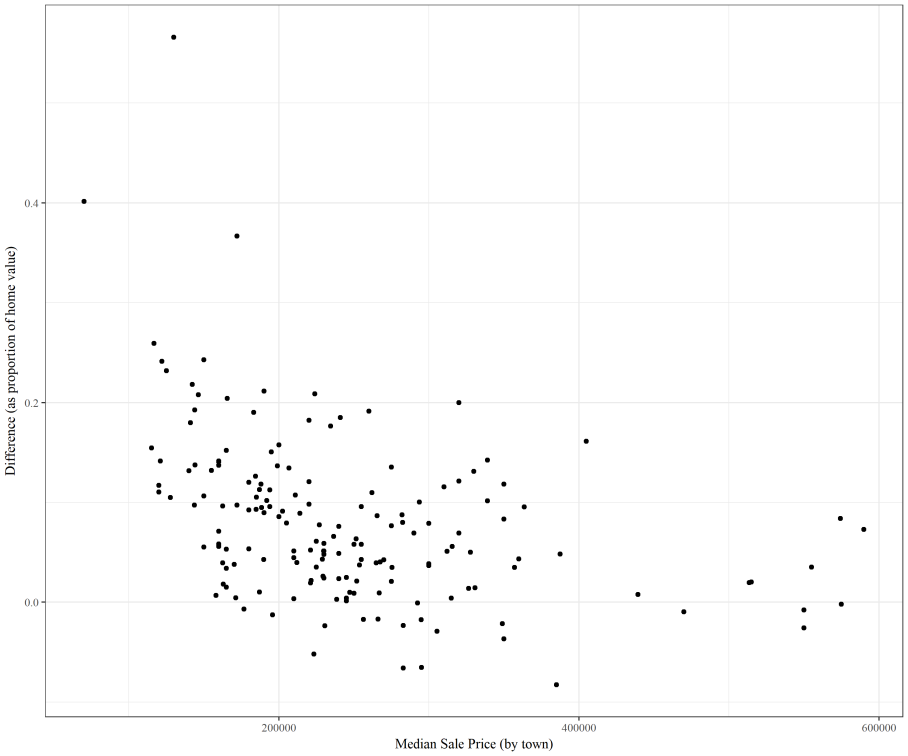


FIGURE 2. Sale Price vs. Appraisal Difference by Town

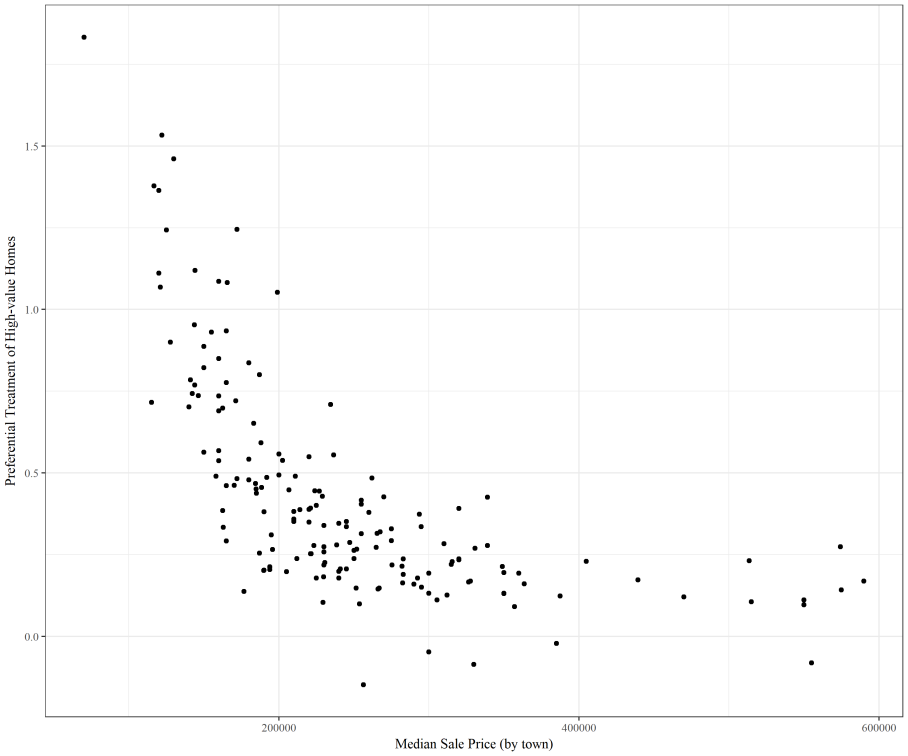


FIGURE 3. Sale Price vs. Appraisal Bias by Town

towns and more accurate appraisals. Figure 3 plots the median sale price for every town against its appraisal bias (where positive values indicates a bias against low-value properties). There is a strong correlation between wealthier towns and less biased appraisals, although in general appraisal bias tends to be very high, with a median value of +32.9%.

In Table 2 we have listed the highest and lowest ten towns for normalized appraisal difference and appraisal bias, ranked by absolute value. Again, a positive appraisal bias indicates bias against low-value homes. A full list of every town and its median sale price, median NAD for low-value, high-value, and all properties, and appraisal bias, can be found in Appendix C. 7 towns exhibit an appraisal bias below 10%, and 16 towns a median NAD below 1%.

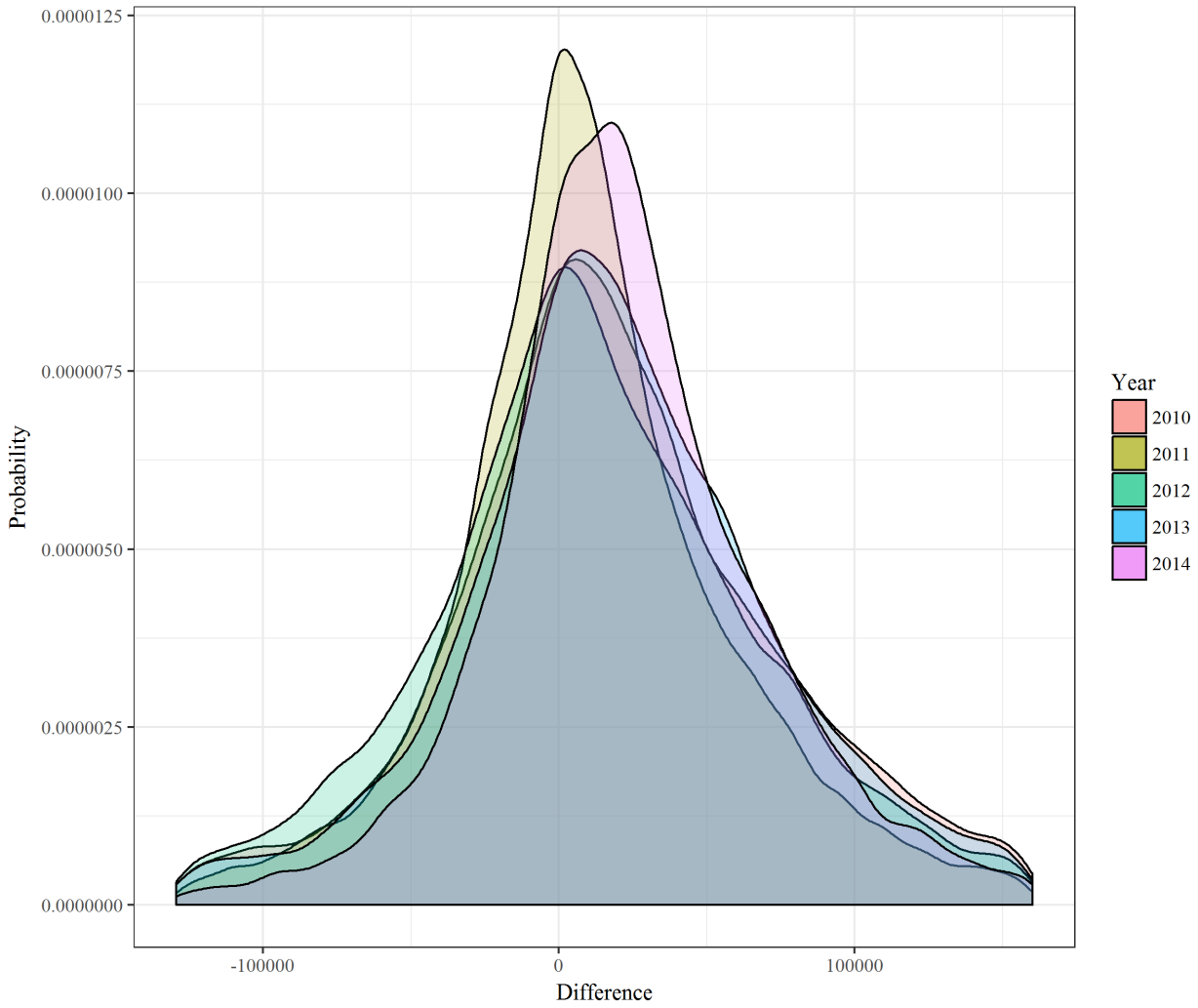
TABLE 2

Median NAD (Absolute Value)				Appraisal Bias (Absolute Value)			
Lowest		**Highest**		**Lowest**		**Highest**	
Town	**Value**	**Town**	**Value**	**Town**	**Value**	**Town**	**Value**
Chesire	-0.084%	Bridgeport	+56.6%	Stamford	-2.14%	Waterbury	+183%
Prospect	+0.134%	Waterbury	+40.1%	Killingworth	-4.76%	Winchester	+153%
Westport	-0.205%	Canaan	+36.7%	New Canaan	-8.08%	Bridgeport	+146%
Danbury	+0.303%	Norwich	+25.9%	Bridgewater	-8.59%	Norwich	+138%
Woodstock	+0.341%	North Canaan	+24.3%	Avon	+9.13%	Hartford	+136%
Brookfield	+0.400%	Winchester	+24.1%	Wilton	+9.64%	Canaan	+125%
Berlin	+0.408%	Torrington	+23.2%	Tolland	+9.93%	Torrington	+124%
Lisbon	+0.449%	New London	+21.8%	Bolton	+10.4%	Griswold	+112%
New Haven	+0.684%	Scotland	+21.1%	Redding	+10.6%	Sprague	+111%
Southbury	-0.695%	Norfolk	+20.9%	Greenwich	+11.2%	Ansonia	+109%

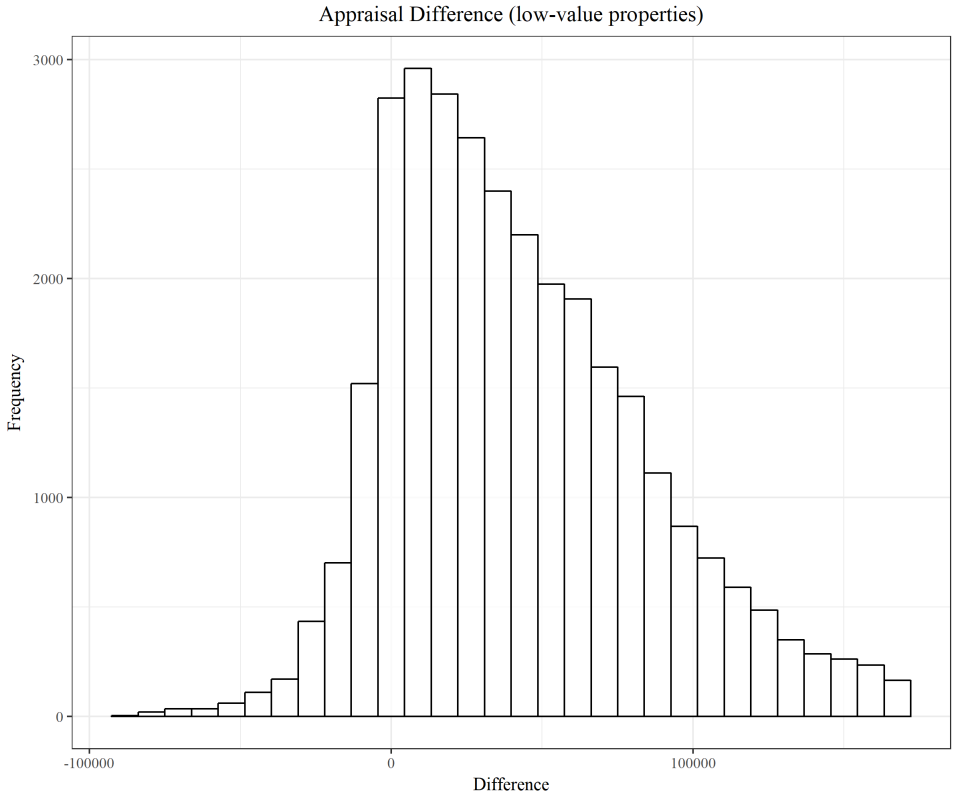
4. CLOSING REMARKS

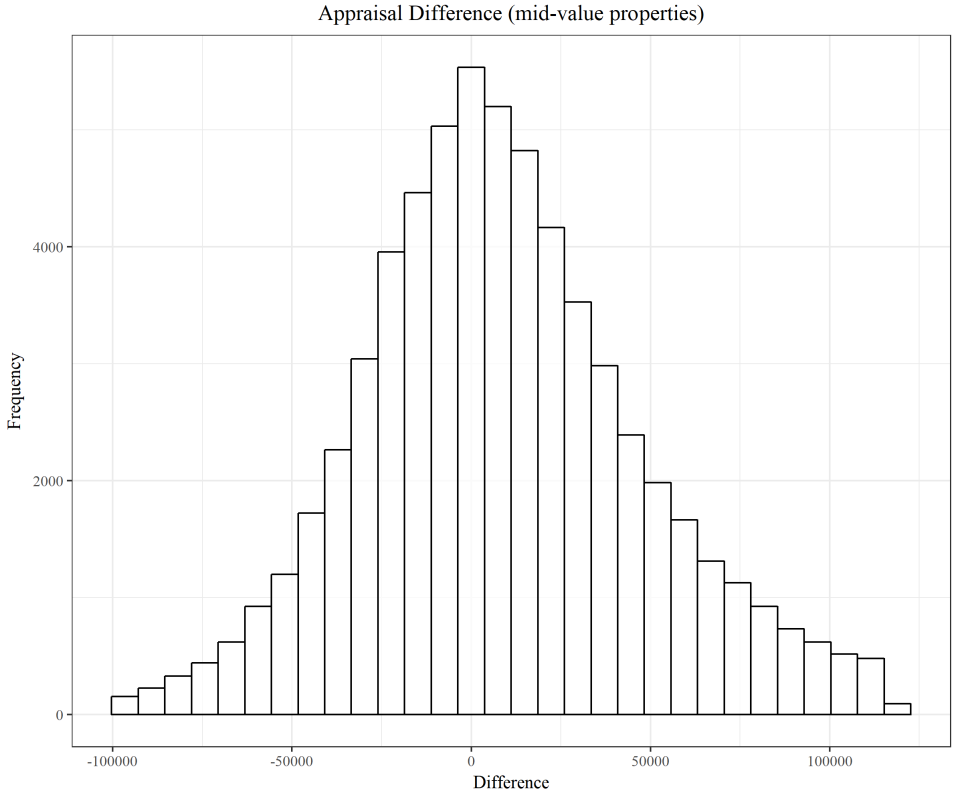
This analysis encompasses only a small proportion of all properties across the state of Connecticut. Furthermore, although by 2011 the worst of the recession had already passed, it is likely that the turmoil of 2008-09 continued to distort the housing market for years to come. Nonetheless, the results of this analysis raise serious concerns. Substantial differences between how low- and high-value properties are treated results in a significant tax burden shift from wealthier to less wealthy property owners, and indicates potential bias in the appraisal process. While the extent of these problems vary by town, nearly every town exhibits appraisal bias against low-value properties, and almost 90% over-appraise properties. Overall, the results results of this analysis suggest that towns need to evaluate their current appraisal process for both accuracy and equity.

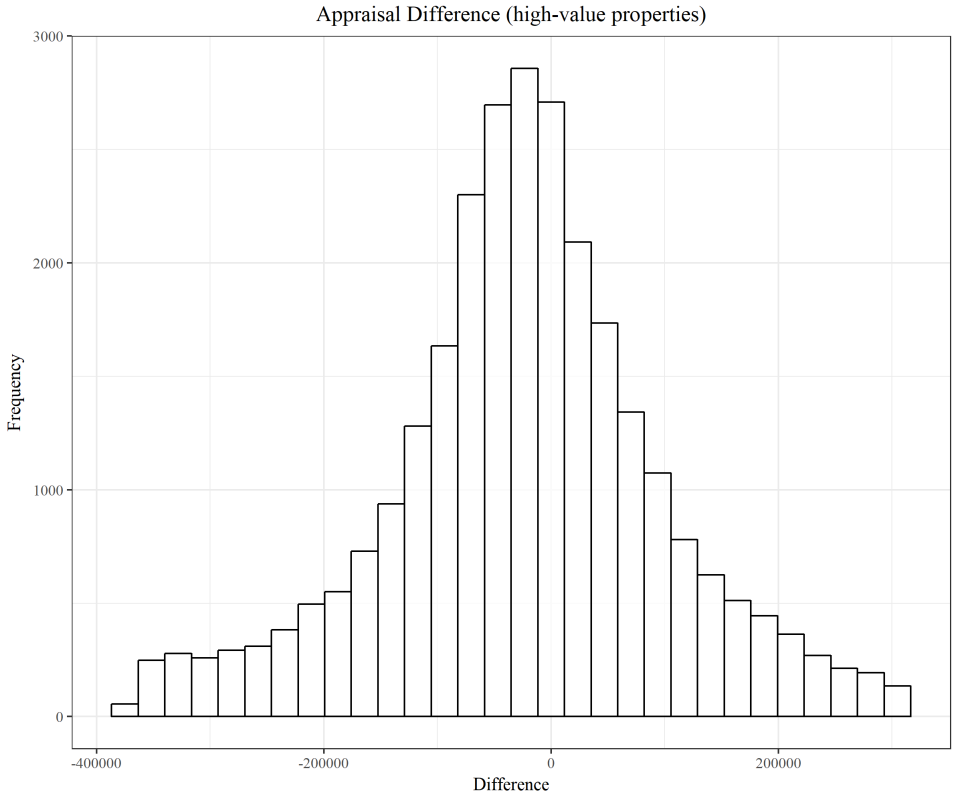
APPENDIX A. APPRAISAL ACCURACY BASED ON APPRAISAL DATE



APPENDIX B. APPRAISAL DIFFERENCE BY PROPERTY GROUP






Appraisal Difference (high-value properties)
Frequency
3000
2000
1000
0
-400000
-200000
0
200000
Difference

APPENDIX C. FULL LIST OF TOWN DATA

Town	Sale Price	NAD (Low)	NAD (High)	NAD (All)	Bias
Andover	210000	+32.94%	-2.95%	+5.13%	+35.89%
Ansonia	160000	+102.12%	-6.42%	+13.71%	+108.55%
Ashford	179950	+43.00%	-4.86%	+5.35%	+47.87%
Avon	357000	+11.84%	+2.71%	+3.49%	+9.13%
Barkhamsted	225000	+39.13%	-0.97%	+6.11%	+40.10%
Beacon Falls	211000	+49.26%	+0.22%	+10.72%	+49.04%
Berlin	245000	+15.99%	-4.66%	+0.41%	+20.65%
Bethany	315500	+18.51%	-4.42%	+5.59%	+22.93%
Bethel	275000	+29.22%	-3.68%	+2.08%	+32.90%
Bethlehem	262000	+50.01%	+1.59%	+10.96%	+48.42%
Bloomfield	185000	+40.96%	-2.85%	+10.53%	+43.81%
Bolton	229500	+10.91%	+0.50%	+2.59%	+10.41%
Bozrah	184500	+48.54%	+1.80%	+12.63%	+46.74%
Branford	250000	+21.61%	-2.19%	+5.80%	+23.80%
Bridgeport	129950	+159.27%	+13.26%	+56.59%	+146.01%
Bridgewater	330000	+11.72%	+20.31%	+13.10%	-8.59%
Bristol	160000	+48.61%	-5.14%	+5.84%	+53.74%
Brookfield	315000	+19.81%	-2.23%	+0.40%	+22.04%
Brooklyn	180000	+55.29%	+1.12%	+9.23%	+54.17%
Burlington	312000	+14.76%	+2.07%	+5.11%	+12.69%
Canaan	172000	+137.14%	+12.63%	+36.68%	+124.51%
Canterbury	183250	+76.43%	+11.27%	+19.02%	+65.17%
Canton	290000	+20.91%	+4.93%	+6.93%	+15.98%
Chaplin	160000	+93.60%	+8.63%	+14.14%	+84.97%
Cheshire	292500	+14.01%	-3.89%	-0.08%	+17.90%
Chester	282500	+17.41%	+1.08%	+7.98%	+16.33%
Clinton	240000	+35.40%	+0.76%	+4.88%	+34.64%
Colchester	221000	+24.29%	-0.98%	+1.92%	+25.27%

Colebrook	220000	+69.51%	+14.59%	+18.21%	+54.91%
Columbia	223375	+17.05%	-10.79%	-5.18%	+27.84%
Cornwall	320000	+53.18%	+14.00%	+20.00%	+39.18%
Coventry	200000	+55.34%	-0.42%	+8.57%	+55.77%
Cromwell	187000	+20.49%	-5.04%	+1.02%	+25.53%
Danbury	238600	+21.77%	-6.18%	+0.30%	+27.95%
Darien	590000	+12.71%	-4.22%	+7.28%	+16.92%
Deep River	230000	+35.25%	+1.29%	+4.79%	+33.96%
Derby	143825	+74.12%	-2.79%	+19.25%	+76.91%
Durham	282000	+26.57%	+5.05%	+8.77%	+21.52%
East Granby	251450	+19.61%	+4.81%	+6.35%	+14.80%
East Haddam	220000	+39.40%	+0.52%	+9.83%	+38.87%
East Hampton	230000	+25.14%	-2.33%	+5.13%	+27.47%
East Hartford	127772	+87.86%	-2.13%	+10.49%	+89.98%
East Haven	160000	+69.50%	+0.51%	+14.05%	+68.99%
East Lyme	247200	+26.59%	-2.13%	+0.98%	+28.72%
East Windsor	163000	+24.51%	-8.91%	+1.82%	+33.42%
Eastford	200000	+40.23%	-9.17%	+15.76%	+49.39%
Easton	513500	+19.37%	-3.83%	+1.95%	+23.21%
Ellington	240000	+15.18%	-2.67%	+2.37%	+17.84%
Enfield	162500	+31.71%	-6.81%	+3.93%	+38.52%
Essex	300000	+15.43%	+2.23%	+3.85%	+13.19%
Fairfield	439450	+12.55%	-4.74%	+0.78%	+17.30%
Farmington	266000	+9.05%	-5.51%	-1.71%	+14.56%
Franklin	184750	+50.32%	+5.20%	+9.29%	+45.12%
Glastonbury	305500	+5.81%	-5.40%	-2.92%	+11.20%
Goshen	275000	+28.81%	-0.46%	+7.65%	+29.26%
Granby	267000	+12.17%	-2.58%	+0.94%	+14.75%
Greenwich	550000	+6.36%	-4.83%	-0.78%	+11.19%
Griswold	144000	+109.57%	-2.39%	+13.73%	+111.96%
Groton	172000	+48.18%	-0.07%	+9.72%	+48.25%

Guilford	339000	+31.97%	+4.19%	+10.14%	+27.78%
Haddam	265500	+36.41%	+4.87%	+8.67%	+31.54%
Hamden	188000	+56.29%	-2.91%	+11.84%	+59.20%
Hampton	194000	+21.41%	+0.06%	+9.58%	+21.34%
Hartford	120000	+124.58%	-11.79%	+11.71%	+136.37%
Hartland	221500	+24.08%	-1.18%	+2.18%	+25.25%
Harwinton	225000	+15.60%	-2.25%	+3.52%	+17.84%
Hebron	267500	+30.81%	-1.20%	+4.04%	+32.01%
Kent	241000	+32.71%	+12.02%	+18.50%	+20.69%
Killingly	141000	+82.72%	+4.22%	+17.98%	+78.51%
Killingworth	300000	-2.30%	+2.46%	+3.67%	-4.76%
Lebanon	195000	+37.26%	+6.20%	+15.07%	+31.06%
Ledyard	213950	+42.52%	+3.74%	+8.89%	+38.78%
Lisbon	171200	+63.58%	-8.50%	+0.45%	+72.09%
Litchfield	270000	+38.74%	-3.94%	+4.25%	+42.68%
Lyme	320000	+21.21%	-2.24%	+12.12%	+23.45%
Madison	363500	+22.49%	+6.36%	+9.53%	+16.14%
Manchester	160000	+54.29%	-2.50%	+7.12%	+56.79%
Mansfield	205000	+20.70%	+0.93%	+7.92%	+19.77%
Marlborough	250000	+22.00%	-4.35%	+0.89%	+26.35%
Meriden	143750	+90.15%	-5.18%	+9.72%	+95.33%
Middlebury	294950	+30.48%	-3.10%	-1.76%	+33.58%
Middlefield	209900	+33.04%	-2.16%	+4.44%	+35.20%
Middletown	190000	+40.35%	+2.24%	+8.97%	+38.11%
Milford	255000	+35.74%	-4.75%	+4.29%	+40.49%
Monroe	327750	+17.97%	+1.01%	+5.00%	+16.96%
Montville	164950	+91.04%	-2.36%	+5.32%	+93.40%
Morris	220000	+39.79%	+4.86%	+12.08%	+34.93%
Naugatuck	140000	+69.63%	-0.55%	+13.16%	+70.18%
New Britain	121000	+100.79%	-6.06%	+14.15%	+106.85%
New Canaan	555000	-8.05%	+0.03%	+3.50%	-8.08%

New Fairfield	300000	+26.36%	+6.98%	+7.91%	+19.38%
New Hartford	240000	+25.04%	+5.12%	+7.60%	+19.92%
New Haven	158000	+41.22%	-7.75%	+0.68%	+48.97%
New London	142200	+81.06%	+6.78%	+21.81%	+74.28%
New Milford	255000	+32.22%	+0.79%	+5.81%	+31.42%
Newington	195800	+18.16%	-8.47%	-1.27%	+26.62%
Newtown	348950	+18.74%	-2.62%	-2.13%	+21.36%
Norfolk	224000	+42.61%	-1.89%	+20.88%	+44.50%
North Branford	252000	+25.26%	-1.47%	+2.11%	+26.73%
North Canaan	150000	+93.74%	+11.58%	+24.27%	+82.16%
North Haven	255000	+40.15%	-1.48%	+9.57%	+41.63%
North Stonington	229000	+40.59%	-2.26%	+4.32%	+42.85%
Norwalk	360000	+18.11%	-1.26%	+4.33%	+19.38%
Norwich	116750	+148.06%	+10.27%	+25.91%	+137.78%
Old Lyme	320000	+19.64%	-4.11%	+6.92%	+23.75%
Old Saybrook	310000	+33.69%	+5.29%	+11.55%	+28.40%
Orange	330750	+21.89%	-5.10%	+1.44%	+26.99%
Oxford	326571	+16.19%	-0.43%	+1.39%	+16.62%
Plainfield	150000	+84.15%	-4.54%	+5.53%	+88.69%
Plainville	165000	+42.25%	-3.84%	+3.40%	+46.09%
Plymouth	155000	+93.87%	+0.82%	+13.19%	+93.05%
Pomfret	234500	+69.43%	-1.55%	+17.64%	+70.98%
Portland	212000	+23.98%	+0.13%	+3.97%	+23.85%
Preston	199000	+105.03%	-0.22%	+13.64%	+105.25%
Prospect	245000	+31.77%	-3.41%	+0.13%	+35.17%
Putnam	146250	+81.18%	+7.49%	+20.77%	+73.68%
Redding	515000	+8.15%	-2.49%	+2.03%	+10.64%
Ridgefield	470000	+7.79%	-4.28%	-0.97%	+12.07%
Rocky Hill	229900	+18.13%	-0.10%	+5.14%	+18.24%
Roxbury	405000	+30.01%	+7.03%	+16.12%	+22.97%
Salem	236500	+56.86%	+1.39%	+6.59%	+55.47%

Salisbury	350000	+17.88%	+4.72%	+8.33%	+13.16%
Scotland	190000	+35.57%	+15.32%	+21.13%	+20.25%
Seymour	188500	+46.33%	+0.81%	+9.47%	+45.52%
Sharon	260000	+43.05%	+5.13%	+19.13%	+37.92%
Shelton	283000	+19.74%	-4.00%	-2.32%	+23.74%
Sherman	350000	+18.22%	+5.00%	+11.81%	+13.22%
Simsbury	295000	+5.77%	-9.33%	-6.54%	+15.10%
Somers	264900	+22.11%	-5.12%	+3.93%	+27.23%
South Windsor	230000	+18.04%	-3.86%	+2.40%	+21.90%
Southbury	176625	+12.50%	-1.23%	-0.70%	+13.73%
Southington	230700	+17.42%	-5.21%	-2.35%	+22.63%
Sprague	120000	+106.36%	-4.74%	+11.03%	+111.10%
Stafford	160000	+68.33%	-5.17%	+5.59%	+73.50%
Stamford	385000	-9.01%	-6.87%	-8.26%	-2.14%
Sterling	165500	+109.31%	+1.11%	+20.41%	+108.21%
Stonington	245000	+31.10%	-2.45%	+2.48%	+33.55%
Stratford	227000	+39.70%	-4.72%	+7.74%	+44.42%
Suffield	275450	+22.39%	+0.57%	+3.49%	+21.82%
Thomaston	170250	+44.47%	-1.77%	+3.78%	+46.24%
Thompson	150000	+56.05%	-0.33%	+10.65%	+56.38%
Tolland	253750	+10.60%	+0.67%	+3.74%	+9.93%
Torrington	125000	+132.62%	+8.29%	+23.19%	+124.34%
Trumbull	350000	+11.57%	-7.93%	-3.66%	+19.49%
Union	206750	+53.73%	+8.91%	+13.43%	+44.82%
Vernon	162500	+68.10%	-1.77%	+9.62%	+69.87%
Voluntown	180000	+86.86%	+3.17%	+12.00%	+83.69%
Wallingford	221000	+36.77%	-2.43%	+5.21%	+39.20%
Warren	293750	+28.27%	-9.13%	+10.03%	+37.40%
Washington	339000	+40.35%	-2.22%	+14.24%	+42.58%
Waterbury	70125	+186.51%	+3.25%	+40.15%	+183.26%
Waterford	202500	+53.16%	-0.71%	+9.12%	+53.86%

Watertown	192000	+47.06%	-1.55%	+10.17%	+48.61%
West Hartford	283000	+5.66%	-13.31%	-6.58%	+18.97%
West Haven	165000	+80.48%	+2.85%	+15.21%	+77.63%
Westbrook	256415	-18.43%	-3.68%	-1.71%	-14.75%
Weston	574250	+22.57%	-4.87%	+8.38%	+27.44%
Westport	575000	+8.18%	-6.03%	-0.21%	+14.22%
Wethersfield	230000	+21.72%	-4.13%	+5.89%	+25.85%
Willington	194000	+25.87%	+5.39%	+11.26%	+20.48%
Wilton	550000	+0.48%	-9.16%	-2.57%	+9.64%
Winchester	122000	+154.32%	+0.98%	+24.14%	+153.33%
Windham	115168	+73.61%	+1.99%	+15.46%	+71.62%
Windsor	189950	+19.08%	-1.10%	+4.26%	+20.17%
Windsor Locks	164950	+24.70%	-4.51%	+1.52%	+29.21%
Wolcott	187000	+80.31%	+0.29%	+11.28%	+80.02%
Woodbridge	387500	+12.00%	-0.33%	+4.84%	+12.33%
Woodbury	275000	+41.80%	+8.85%	+13.54%	+32.94%
Woodstock	210000	+34.29%	-3.97%	+0.34%	+38.25%