An Empirical Analysis of the Incidence of Location on Land and Building Values

by

Robert J. Gloudemans

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Abstract

Although it is universally acknowledged that property values are first and foremost a function of location, the extent to which location affects land versus building values has not been empirically examined. Traditional valuation models either make no attempt to separate land and building values or make implicit, untested assumptions about the extent to which various location features impact land and buildings.

This paper tests various assumptions concerning the incidence of location factors on land and building values and evaluates the composition of total value between the two parts. The research builds on research conducted in 2000 under a David C. Lincoln Institute Fellowship in Land Value Taxation that explored the use of modern computer-assisted mass appraisal (CAMA) tools to estimate land values in urban residential areas, often with comparatively few vacant land sales. That research concluded that CAMA models combining vacant and improved sales can be used to predict land values with acceptable reliability, even when some neighborhoods lack vacant land sales altogether[1]. Thus, the phase-in of a site valuation tax scheme in which buildings were untaxed or taxed at a lesser percentage than land could continue to use the same sales-based mass appraisal tools commonly used for improved residential properties.

Utilizing the same three data bases as the prior research project, this paper evaluates the extent to which location affects land and building values and how total property value is broken out between the two components. The research results indicate that, while location impacts both land and buildings, on a percentage basis the impact on land is far greater. It also suggests that traditional attempts to separate values between land and buildings are likely unreliably and may well under-estimate the contribution of the land component. A reliable decomposition would seem to requires the incorporation of both vacant and improved sales, at least until more empirical experience is gained with respect to typical land-to-building ratios among various property types and market areas.

[1] See Robert J. Gloudemans, "Implementing a Land Value Tax in Urban Residential Communities," Lincoln Institute of Land Policy Working Paper, 2000 (Product Code WP00RG1).

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An Empirical Analysis of the Incidence of Location on Land and Building Values

Introduction

It is universally acknowledged that location can and usually does heavily influence property values. All valuation models incorporate location variables. However, what is not so clear is whether location influences affect land value only or both land and building values and, if the latter, the extent to which building values are also impacted.

In large part model builders have ignored the questions posed above while making implicit assumptions about the incidence of location influences. Mass appraisal models using the sales comparison approach to value are usually calibrated by either multiple regression analysis (MRA) or the adaptive estimation procedure (AEP), more generally known as "feedback". MRA models generally take the simple, linear form:

$$V = B_0 + B_1*X_1 + B_2*X_2 + ... + B_K*X_K$$

where B_0 is a constant, X_1 ... X_K are property variables for location and improvement features (neighborhood, lot size, living area, age of structure, etc.), and B_1 ... B_K are the corresponding regression coefficients. Notice that such models estimate a total value only and do not explicitly distinguish land and building variables. While some variables are clearly location or land related and others obviously represent building features, it is impossible to say that one affects land or building value only. For example, assume that a premium neighborhood assumes a coefficient of $45,000 and that being adjacent to a green belt contributes $18,000. Do these influences accrue to land only or to both land and buildings value? If the later, what portion constitutes land value and what part building value? Note also that the constant (B_0 in the above formula) can be substantial: typically 15 to 40 percent of total value. By its nature, this includes the fixed portion of both land and building value and cannot be attributed to solely one or the other.

Feedback models generally take the following format:

$$V = \pi GQ * ((\pi LQ * \Sigma LA) + (\pi BQ * \Sigma BA))$$

where

πGQ = product of global qualitative factors (time and location)

πLQ = product of land qualitative factors (lake, river, park, traffic, etc.)

ΣLA = sum of land additive components (lot size)

πBQ = product of building qualitative factors (construction quality, design, condition, etc)

ΣBA = sum of building additive components (main living area, total and finished basement areas, garages, etc.).

Unlike MRA, the feedback model is decomposable into land value (LV) and building value (BV):

$$LV = \pi GQ * \pi LQ * \Sigma LA$$

$$BV = \pi GQ * \pi BQ * \Sigma BA.$$

Note also that the model assumes that location (neighborhood), a general qualitative factor (GQ), is assumed to affect land and building values proportionately, meaning that most would accrue to buildings, and that site amenities (LQ), such as commercial encroachment or location next to a golf course or lake, are assumed to affect land value only.

This paper evaluates these assumptions empirically, with a view to determining the extent to which location and site influences affect land and building values for residential property. It also examines the extent to which total value can be reliably partitioned between land and buildings. Three data bases are examined: Ada County (Boise), Idaho; Jefferson County (suburban Denver), Colorado; and the Clareview market area in Edmonton, Alberta.[2]

Models Tested

The traditional feedback model and four alternative model specifications were tested and compared:

1. Traditional Feedback Model: neighborhood affects land and building values proportionately and location amenities (traffic, golf course, waterfront, etc.) affect land only:

$$V = \pi GQ * ((\pi LQ * \Sigma LA) + (\pi BQ * \Sigma BA))$$

2. Neighborhood and location amenities affect land value only:

$$V = \pi GQ * \pi LQ * \Sigma LA + \Sigma BA * \pi BQ$$

3. Neighborhood and location amenities proportionately affect both land and building value:

$$V = \pi GQ * \pi LQ * (\Sigma LA + \Sigma BA * \pi BQ)$$

4. Neighborhood and location amenities affect building values one-half as much as land values (e.g., if a premium view adds 30% to land value, it would add 15% to building value):

$$V = \pi GQ * \pi LQ * \Sigma LA + (1 + .5 (\pi GQ * \pi LQ - 1)) * \Sigma BA * \pi BQ$$

[2] There were 4,836 usable sales from 1996-1998 in Jefferson County; 4,382 sales from 1996-1999 in Clareview, and 12,821 sales from 1997-1999 in Ada County. All models tested showed inflation adjustments.

5. Neighborhood and location amenities affect building values at a market-calibrated percentage of land value:

$$V = \pi GQ * \pi LQ * \Sigma LA + (1 + p\ (\pi GQ * \pi LQ - 1)) * \Sigma BA * \pi BQ$$

where *p* is the market-calibrated percentage. For example, if *p* = .40, neighborhood and location amenities would affect building values 40 percent as much as land values.

The value of p in model 5 is of considerable theoretical and practical interest from both an appraisal and land policy viewpoint as it indicates the extent to which location impacts building along with land values. For example, will increased traffic congestion lower land value only, or also impact residential building values? Will setting aside green belts and parks enhance building values along with land values?

Each of the five models delineated above was tested on all three data bases twice: once using improved sales only and once using both vacant and improved sales. Since most single-family valuation models only use improved sales, a comparison of the first set of models better answers the question of which is likely to provide the best empirical results. Is the traditional feedback model the best formulation or is there a better one? However, the latter set of models that incorporate vacant land sales will provide a more reliable allocation between land and building values, because inclusion of vacant sales helps ensure that estimated land values are essentially correct (otherwise there is no control mechanism to unsure that land value estimates match actual values).

The models were calibrated using nonlinear regression analysis, which allows the model builder to specify and calibrate any well-formulated model structure.[3] Further, although the models were calibrated with SPSS, since nonlinear regression uses a standard algorithm, the same results can be obtained with any other statistical package incorporating nonlinear regression.

Variables available for analysis in each of the three data bases included geographic area (MLS area or neighborhood), lot size, living area, secondary areas (basements, porches, etc.), garage area, construction quality, building style and age, sale date, and such miscellaneous items as fireplaces and swimming pools. In addition, the Edmonton and Jefferson County data bases included relevant location amenities: waterfront, golf course, commercial encroachment, traffic, and so forth.

The traditional feedback model formulations for models with both vacant and improved sales looked as follows:

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[3]In contrast, traditional linear regression analysis is incapable of calibrating "hybrid" models encompassing both additive and multiplicative components. A feedback algorithm would only be applicable to compatible model structures and would give somewhat different results depending on the software chosen (run times would also be much longer). As with regular (linear) MRA, nonlinear regression works on the principle of minimizing the squared errors from the model, whereas as feedback seeks to minimize the absolute errors.

V = TIME_FAC * NBHD_FAC * [SITUS_FAC * BLV * LSIZ_FAC * VAC_FAC

+ (LIVAREA * STYLE_FAC + SEC_AREAS + GARAGE + MISC) * QUAL_FAC

* PCT_GOOD]

where TIME_FAC = time (inflation) factor, NBHD_FAC = neighborhood factors, SITUS_FAC = factors for site amenities such as lake and view, BLV = base land value (value of the typical sized lot in the "base" neighborhood), LSIZ_FAC = land size adjustment, VAC_FAC = factor for vacant (versus improved) land, LIVAREA = living area, STYLE_FAC = factor for design type, SEC_AREAS = secondary areas (basements, decks, patios, etc.), GARAGE = garage size, MISC = miscellaneous items (pools, fireplaces, air conditioning, etc.), QUAL_FAC = factor for construction quality, and PER_GOOD = percent good dependent on age/condition. The corresponding models with improved only sales were identical except that VAC_FAC was omitted.

Of course, the specific location amenities, building styles, secondary items, and so forth differed somewhat among the three data bases. Appendix 1 shows the specification of the traditional feedback model with vacant and improved sales in each of the three areas in SPSS format.[4] The other four model specifications described above used the same variables; they differed only in their assumptions about how the location-related variables affect land and building values.

Model Results - Improved Only Sales

Nonlinear regression was used to calibrate the traditional feedback model specifications for each data base. Appendix 2 contains the results. Adjusted R-Squares were .959 in Jefferson County, .882 in Clareview, and .909 in Ada County. In general, all the variables behaved as expected, expect that the size adjustment variable was statistically insignificant with the wrong sign in the Ada County model and was therefore excluded. Some of the site amenity factors are quite large, for example, a multipliers of 2.10 for waterfront location and 1.27 for parks in Jefferson County. Recall, however, that these factors apply only to land value in the traditional feedback formulation. Interestingly, exponents for land size factors (actual lot size divided by typical lot size) ranged from 0.19 to 0.34, indicating that land values increase modestly with size.

Exhibit 1 shows summary results for all five models with improved only sales. Probably the most salient aspect of the results is the amazing similarity in model performance measures across all five models. For example, in Jefferson County adjusted R-squares are all .959, medians range from .998 to 1.003, and the coefficient of dispersion, a measure of the average spread of the sales ratios about the median ratio, ranges from 5.39 to 5.52, all very good. Performance measures are similarly tight

[4] Double asterisks in SPSS (**) indicate exponentiation.

in the other two jurisdictions. In fact, in Ada County the other models failed to improve on the traditional feedback formulation. In the other two areas, improvements were marginal at best. Also of interest is the high base land values estimated for Jefferson County and Clareview. In Jefferson County, the estimated value of the typical lot (.20 acres) in the base neighborhood ranged from $71,005 to $82,587, equivalent to 47 to 55 percent of the average sale price in the same neighborhood. In Clareview the percentages were all slightly above 0.50. In contrast, in Ada County the percentages were of the textbook variety: 18-22 percent. Of course, in Jefferson and Clareview the highest land values were obtained in model 2, in which neighborhood and location adjustments applied to land only (Ada County had no site amenity variables). The seemingly high land values obtained in two of the areas and highly different, more traditional results in the third call into question the reliability of the land and improvement values developed by feedback, as well as other model specification and calibration techniques. To be sure, the total value estimates appear highly accurate, but the allocation appears suspect. The primary reason is almost surely the lack of a constant in all five model specifications. For both Jefferson County and Clareview, traditional MRA models (not shown) develop sizeable constants, which represent the fixed portion of land and building values. With no constant, the present models undoubtedly "load up" on the base land value, which by default includes the fixed portion of building value as well as the fixed portion of land value. Recall that in Ada county, the size adjustment factor was immaterial, indicating that a constant was unnecessary. Thus, in that case, the base land value (BLV) probably represents land only and behaves reasonably. The bottom line is that real estate models have both fixed and variable elements and the fixed portions cannot be conveniently allocated between land and buildings, at least when models utilizes only improved sales. Feedback models may purport to break out land and building values, but the allocations are not necessarily realistic.

Exhibit 1 also indicates the average adjustment made in the models for neighborhood and situs factors (waterfront, traffic, etc.).[5] Situs factors are most important in Jefferson County, where there are considerable view, waterfront, golf, open space, traffic, and other influences. Its neighborhood adjustments are also the largest. Location adjustments are least important in Clareview, a more homogeneous area. As would be expected, in all three areas neighborhood adjustments are highest in model 2, in which they apply to land only. In both Jefferson County and Clareview situs adjustments are lowest in models 3-5, where they are spread to both land and improvements (versus land only in models 1 and 2).

Finally, exhibit 1 also indicates the percentage by which neighborhood and situs adjustments were found in model 5 to impact buildings relative to land. Interestingly, the percentages are almost identical in Jefferson and Ada County: 0.44 and 0.45, respectively (both factors were easily significant at the 99% confidence level with t-values near 5.0). In Clareview, a more homogeneous market area, the variable was not statistically significant, indicating that the market could not distinguish the relative impact of location on land and buildings. Thus, where location influences

[5] These were computed by averaging the absolute adjustments indicated by all such coefficients in the model.

are substantial, the best evidence from the research is that, on a percentage basis, the incidence of location influences on building is slightly less than half that on land. What is probably most important from a valuation standpoint, however, is that assessment uniformity (particularly as measured by the COD) is similar regardless of whether location-related influences are attributed to land only or some combination of land and buildings.

Model Results - Vacant and Improved Sales

Each of the five models were rerun using both improved and vacant sales. The inclusion of vacant sales provides benchmarks to help ensure a proper allocation of value to land and buildings. There were 232 usable vacant lot sales in Jefferson County (4.5%), 900 in Clareview (20.5%), and 2,184 in Ada County (14.6%). Appendix 3 shows results for the traditional feedback model (model 1 in appendix 1).

Exhibit 2 summarizes key results from the models. While CODs for the improved sales are similar in all five models, CODs for vacant sales vary considerably. In all three cases model 5, in which the model determines the optimal allocation of location adjustments between land and improvements, produces the best results. Either the traditional feedback model (model 1) or a variation in which both neighborhood and situs adjustments are applied proportionately to land and buildings (model 3) produces the worst CODs for vacant land. As the exhibit shows, model 5 suggests that adjustments to buildings values are in the range of only 12% to 21% of the adjustments applicable to land (versus closer to one-half in the models with improved sales only).[6] Thus, the models indicate that buildings values vary with location, but not nearly to the extent that land values do.

The models also indicate that vacant and improved land can differ substantially in value. In Jefferson County, the models indicate that build-on land commands substantial premiums. In the best model (model 5), the factor for vacant land (VAC_FAC) suggests that vacant land is worth approximately 70% as much as improved land, producing a reasonable land-to-total value ratio of 23% when land values are viewed as if vacant (as is traditional for appraisal purposes). In Ada County, on the other hand, vacant land seems to command a slight premium, with the best model (model 5) yielding a vacant factor (VAC_FAC) of 1.22. Most interestingly, however, as in Jefferson county, for the typical parcel this also results in a land-to-total value ratio of 23%. Although the Clareview models produce mixed results concerning the relationship between vacant and improved land values, all suggest highly similar land-to-total value ratios of 34% to 36%, which seem reasonable considering the comparatively modest residences in the area (average living area of 120 square meters, largely “standard” construction quality, and an average year built of 1982). Further the statistical reliability of the vacant land indicators (VAC_FAC in appendices 1 and 3) upon which these relationship are based is very high (for example, t-value for the variable in model 5 are 15.6 in

[6] t-values for the variable were 6.8 in Jefferson County, 7.23 in Ada County, and 2.77 in Clareview, where location influences are considerably less.

Jefferson County, 11.3 in Clareview, and 36.6 in Ada County).

Contrast the indicated land-to-total value ratios in Jefferson and Ada counties with the much higher ratios of approximately 50% based on improved only sales (Exhibit 1). The results clearly caution against attempting to decompose estimated values, whether generated by feedback or otherwise, into land and building components unless vacant sales are included in the models so as to provide benchmarks ("reality checks") for the land component. It appears that valuation models can be reasonably decomposed into land and building values, but only if land sales are used to provide reliable benchmarks for vacant land values and only if models are properly and carefully specified.

Conclusions

The research sheds light on the degree to which neighborhood and location factors affect land versus building values and the relationship that can exist between vacant and improved land in various residential markets. The primary conclusions are summarized below.

6. Mass appraisal models are remarkably robust in capturing neighborhood and location influences for improved properties. As long as the proper variables are included, almost any reasonable model formulation will succeed in incorporating proper adjustments. If location variables are assumed to impact land only, *percentage* adjustments will be comparatively high. If they are assumed to impact land and buildings equally, adjustment factors will be more modest, although in dollar terms adjustments may be approximately equivalent.

7. Location affects both land and buildings, but in percentage terms the impact on land is much greater (in dollar terms the impacts can be similar). These differences become particularly apparent when both vacant and improved sales are included in models.

8. Models that incorporate only improved sales are unlikely to be decomposable into reliable building and land values. In good part this is because the fixed portion of building values (site preparation and other fixed costs, developers profit, value of a residence in place, etc.) are likely to be attributed to location variables, which have a high fixed element. Incorporating vacant land sales into models can help develop more realistic land values with little loss in predictive accuracy for improved properties.

9. Vacant and improved land values can differ substantially. In good part, this depends on how "improved land" is defined, that is, whether site preparation, landscaping, and the like are ascribed to land or buildings. In any case, being fixed costs in nature and not linked to other improvement variables, valuation models that lack a constant will tend to ascribe fixed building costs to land or location variables. Thus, other things equal, models will likely show improved land to be worth more than vacant land. Of course, these relationship can vary substantially among markets with the degree of services in place for vacant land and the remaining supply of and demand for vacant sites.

10. For improved properties, a site value tax would require a workable definition of the value

subject to tax, i.e., land as vacant versus land as improved. Modern mass appraisal methods are capable of producing reasonable estimates of the value of land as if vacant even in neighborhoods with no or few vacant land sales, provided there are other neighborhoods in the model with adequate vacant land sales to provide reality checks. Once experience is gained with such models, typical land-to-value relationships for various property types and markets could likely emerge.

Exhibit 1
Summary Results for Models with Improved Only Sales

	Model 1	Model 2	Model 3	Model 4	Model 5
Jefferson County					
Adj R-Square	0.959	0.958	0.959	0.959	0.959
Median	1.003	0.998	0.999	0.998	0.998
COD	5.48	5.52	5.39	5.41	5.42
Base LV	71,005	82,587	73,885	74,587	74,235
Land/Total	0.47	0.55	0.49	0.49	0.49
Ave. NBHD Adj	0.103	0.225	0.103	0.142	0.148
Ave. Situs Adj	0.312	0.236	0.106	0.15	0.158
NBHD Bldg Factor	1.00	0.00	1.00	0.50	0.44
Situs Bldg Factor	0.00	0.00	1.00	0.50	0.44
Clareview (Edmonton)					
Adj R-Square	0.882	0.882	0.882	0.882	0.882
Median	1.000	1.000	1.000	1.000	1.000
COD	5.82	5.80	5.82	5.82	5.82
Base LV	63,780	65,900	62,285	63,779	61,089
Land/Total	0.53	0.55	0.52	0.53	0.51
Ave. NBHD Adj	0.037	0.067	0.037	0.049	0.027
Ave. Situs Adj	0.035	0.033	0.017	0.023	0.012
NBHD Bldg Factor	1.00	0.00	1.00	0.50	0.50
Situs Bldg Factor	0.00	0.00	1.00	0.50	n.s.
Ada County (Boise)					
Adj R-Square	0.909	0.908	N/A	0.909	0.909
Median	1.004	1.002	N/A	1.003	1.003
COD	8.64	8.71	N/A	8.64	8.64
Base LV	30,263	24,465	N/A	29,271	29,070
Base LV	0.22	0.18	N/A	0.21	0.21
Ave. NBHD Adj	0.060	0.318	N/A	0.099	0.106
Ave. Situs Adj	N/A	N/A	N/A	N/A	N/A
NBHD Bldg Factor	1.00	0.00	N/A	0.50	0.45
Situs Bldg Factor	0.00	0.00	N/A	0.50	0.45

Model 1: Traditional feedback formulation: NBHD adj applied to L/B; situs adj to land only

Model 2: NBHD and situs adj applied to land only

Model 3: NBHD and situs adj applied to both land and buildings (same rates)

Model 4: NBHD and Situs Adj applied to buildings at half the rate applied to land

Model 5: NBHD and situs adj applied to buildings at calibrated percentage of rates for land

Exhibit 2
Summary Results for Models with Improved and Vacant Sales

	Model 1	Model 2	Model 3	Model 4	Model 5
Jefferson County					
Adj R-Square	0.962	0.961	0.960	0.961	0.962
Median	0.998	0.998	0.999	0.998	0.998
COD - Improved	5.60	5.56	5.42	5.54	5.57
COD - Vacant	14.60	12.42	19.87	12.65	11.61
Base LV - Improved	51,079	75,740	56,554	47,423	48,793
Vacant Factor	0.77	0.45	0.84	0.86	0.70
Base LV - Vacant	39,535	34,386	47,505	40,736	34,301
Land (Vac)/Total	0.26	0.23	0.31	0.27	0.23
NBHD Bldg Factor	1.00	0.00	1.00	0.50	0.21
Situs Bldg Factor	0.00	0.00	1.00	0.50	0.21
Clareview (Edmonton)					
Adj R-Square	0.952	0.952	0.951	0.952	0.952
Median	1.001	0.999	1.001	1.004	0.999
COD - Improved	5.87	5.89	5.88	5.89	5.89
COD - Vacant	10.73	10.15	10.70	9.95	9.55
Base LV - Improved	47,250	53,323	30,868	33,083	40,401
Vacant Factor	0.89	0.77	1.39	1.29	1.06
Base LV - Vacant	42,053	41,165	42,814	42,776	42,946
Land/Total	0.35	0.34	0.36	0.36	0.
NBHD Bldg Factor	1.00	0.00	1.00	0.50	0.17
Situs Bldg Factor	0.00	0.00	1.00	0.50	0.17
Ada County (Boise)					
Adj R-Square	0.922	0.922	N/A	0.922	0.923
Median	1.013	1.008	N/A	1.012	1.008
COD - Improved	8.71	8.76	N/A	8.73	8.77
COD - Vacant	22.96	18.18	N/A	21.47	17.73
Base LV - Improved	31,109	23,524	N/A	29,869	26,412
Vacant Factor	1.10	1.15	N/A	1.14	1.22
Base LV - Vacant	34,344	27,100	N/A	33,931	32,170
Land/Total	0.25	0.19	N/A	0.24	0.23
NBHD Bldg Factor	1.00	0.00	N/A	0.50	0.12
Situs Bldg Factor	0.00	0.00	N/A	0.50	0.12

Model 1: Traditional feedback formulation: NBHD adj applied to L/B; situs adj to land only
Model 2: NBHD and situs adj applied to land only
Model 3: NBHD and situs adj applied to both land and buildings (same rates)
Model 4: NBHD and Situs Adj applied to buildings at half the rate applied to land
Model 5: NBHD and situs adj applied to buildings at calibrated percentage of rates for land

Appendix 1
Format of Traditional Feedback Models (Vacant and Improved Sales)

Jefferson County - Economic Area 4

```
VALUE = TIMEFAC**MONTHS
 * N701**NB701 * N702**NB702 * N703**NB703 * N704**NB704 * N706**NB706
* N801**NB801 * N803**NB803 * N804**NB804 * N805**NB805 * N806**NB806   *
N807**NB807 * N808**NB808 * N809**NB809 * N810**NB810 * N811**NB811   *
N812**NB812 * N814**NB814 * N815**NB815 * N816**NB816 * N902**NB902   *
N903**NB903 * N904**NB904 * N1701**NB1701 * N1702**NB1702
 * N1703**NB1703 * N1704**NB1704 * N1705**NB1705 * N1706**NB1706
 * N1707**NB1707 * N1708**NB1708 * N1709**NB1709 * N1710**NB1710
 * N1711**NB1711 * N1712**NB1712 * N1713**NB1713 * N1715**NB1715
 * N1801**NB1801 * N1802**NB1802 * N1803**NB1803 * N1804**NB1804
 * N1805**NB1805 * N1806**NB1806 * N1807**NB1807 * N1808**NB1808
 * N1809**NB1809 * N1810**NB1810 * N1811**NB1811 * N1813**NB1813
 * N1814**NB1814 * N1815**NB1815 * N1816**NB1816 * N2901**NB2901
 * N3001**NB3001 * N3004**NB3004
 * ((TRAF_FAC**TRAFFIC * VIEW_FAC**VIEW * WATERFAC**WATERFNT
 * GOLF_FAC**GOLF * OPEN_FAC**OP_SPACE * PARK_FAC**PARK
 * COMM_FAC**COMM * SOIL_FAC**SOIL_PRB
 * BLV * LSIZ_FAC**LSIZ_EXP * VAC_FAC**VACANT)
 + (B1*LIVAREA * BSIZ_FAC**BSIZ_EXP * BI**BILEVEL * STY2**TWOSTORY
 * SPLT**SPLIT * AC**AIRCOND * BRICK**MASONRY
 + BSMT*TOTBSMT + FINBSMT*BSMTFIN + PORCH_SF*PORCH
 + BALC_SF*BALCONY + GARAGE*GARAGECP + WALK_OUT*WALKOUT + BATH*BATHS
 + FIREPLAC*FPLACES + POOL*LINPOOL)
 * (QUAL2**Q2 * QUAL4**Q4 * QUAL5**Q5 * PERGOOD**PCTGOOD)).
```

Edmonton - Clareview

```
VALUE = TIMEFAC**MONTHS * WINT_FAC**WINTER
 * N2030**NB2030 * N2070**NB2070 * N2120**NB2120 * N2130**NB2130
 * N2240**NB2240 * N2260**NB2260 * N2280**NB2280 * N2320**NB2320
 * N2340**NB2340 * N2350**NB2350 * N2390**NB2390 * N2400**NB2400
 * N2430**NB2430 * N2440**NB2440 * N2450**NB2450 * N2500**NB2500
 * N2510**NB2510 * N2530**NB2530 * N2541**NB2541 * N2580**NB2580
 * N2590**NB2590 * N2710**NB2710 * N2720**NB2720 * N3030**NB3030
 * N3040**NB3040 * N3060**NB3060 * N3080**NB3080 * N3090**NB3090
 * N3150**NB3150 * N3180**NB3180 * N3190**NB3190 * N3280**NB3280
 * N3320**NB3320
 *((LAKE_FAC**LAKE * RIV_FAC**RIVER * RAV_FAC**RAVINE
 * PARK_FAC**PARK * TRAF_FAC**TRAFFIC * COMM_FAC**COM_MF
 * BLV * LSIZ_FAC**LSIZ_EXP * VAC_FAC**VACANT)
 + (B1 * LIVAREAZ * BSIZ_FAC**BSIZ_EXP * BILEV**BILEVEL
 * SPLITLEV**SPLIT * SPLCRWL**SPLTCRWL * TWOSTY**TWO_STY
 * BRICK**ALLBRICK * TILEROOF**PREMROOF + BSMT*BSMTAREA
 + BSMTFIN*FBSTAREA + ATTGAR*ATTGARSZ + DETGAR*DETGARSZ
 + FP_MAS*FPMASON + FP_ZERO*FPZERCL)
 * (Q5**QUAL5 * Q6**QUAL6 * Q7**QUAL7 * PERGOOD**PCTGOOD)).
```

Appendix 1 (Continued)

Ada County (Boise)

```
VALUE = TIMEFAC**MONTHS
 * MLS100**MLS_100 * MLS200**MLS_200 * MLS300**MLS_300
 * MLS400**MLS_400 * MLS500**MLS_500 * MLS550**MLS_550
 * MLS600**MLS_600 * MLS700**MLS_700 * MLS750**MLS_750
 * MLS800**MLS_800 * MLS900**MLS_900 * MLS1000**MLS_1000
 * MLS1010**MLS_1010 * MLS1020**MLS_1020 * MLS1030**MLS_1030
 * MLS1100**MLS_1100
 * ((BLV * LSIZ_FAC**LSIZ_EXP * VAC_FAC**VACANT)
 + (B1*LIVAREAZ * TWOSTY**TWOSTORY * SPLITLV**SPLIT
 * TRILEVL**TRILEVEL * SIMP_SHP**SHP_SIMP * IRRG_SHP**SHP_IRRG
 * CPLX_SHP**SHP_CPLX * AC**AIRCOND * PREM_RF**ROOF_GD
 + BSMTFIN*BSMT_FIN + BSMTUNF*BSMT_UNF + LWRUNF*LWR_UNF
 + PORCH*PORCHSF + PATIO*PATIOSF + DECK*DECKSF
 + GARAGE*GARAGECP + POOL*POOLSF + FIREPLAC*FPLACE)
 * (QUAL3**Q3 * QUAL5**Q5 *QUAL6**Q6 * QUAL7**Q7
 * PERGOOD**PCTGOOD * REMODFAC**REMODEL)).
```

Appendix 2-A
Results of Nonlinear MRA for Traditional Feedback Model Structure: Jefferson County (Area 4) - Improved Sales

Nonlinear Regression Summary Statistics Dependent Variable SALE_PRI

Source	DF	Sum of Squares	Mean Square
Regression	85	2.052175E+14	2414323339472
Residual	4533	1411932161544	311478526.703
Uncorrected Total	4618	2.066294E+14	
(Corrected Total)	4617	3.445049E+13	

R squared = 1 - Residual SS / Corrected SS = .95902

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
B1	45.248290998	2.321204983	40.697597748	49.798984249
BSMT	10.255385575	1.001797083	8.291374960	12.219396189
BSMTFIN	9.812872089	.769694192	8.303896281	11.321847898
PORCH_SF	17.373544972	2.572122665	12.330930753	22.416159192
BALC_SF	10.943130917	2.058229237	6.907998316	14.978263517
GARAGE	19.445162062	2.608288689	14.331644807	24.558679316
WALK_OUT	6755.0278643	912.22771253	4966.6168773	8543.4388513
BATH	2999.9743925	820.43125386	1391.5292112	4608.4195738
FIREPLAC	2476.7529649	612.58074091	1275.7961068	3677.7098230
POOL	12651.096349	2746.5338768	7266.5511369	18035.641560
QUAL2	.942547970	.024174530	.895154107	.989941833
QUAL4	1.197403614	.014128258	1.169705342	1.225101886
QUAL5	1.315568517	.021629658	1.273163844	1.357973190
BI	.791409025	.027031796	.738413528	.844404521
STY2	.885247297	.012211611	.861306587	.909188006
SPLT	.897217463	.014809052	.868184501	.926250425
AC	1.031741392	.007307206	1.017415707	1.046067077
BRICK	1.028324924	.009511219	1.009678298	1.046971549
PCTGOOD	1.579814478	.057106901	1.467857114	1.691771842
BSIZ_EXP	.000752690	.042549251	-.082664583	.084169963
TRAF_FAC	.909922012	.009389186	.891514631	.928329394
VIEW_FAC	1.111753174	.011118220	1.089956042	1.133550306
WATERFAC	2.103584886	.078208550	1.950258004	2.256911767
GOLF_FAC	1.196162274	.039599130	1.118528676	1.273795872
OPEN_FAC	1.089478635	.013273255	1.063456584	1.115500686
PARK_FAC	1.275235163	.056842720	1.163795724	1.386674602
COMM_FAC	.898542850	.036623676	.826742593	.970343107
SOIL_FAC	.473688711	.055798778	.364295907	.583081515
TIMEFAC	1.005408792	.000188217	1.005039794	1.005777790
N701	.987740621	.023387415	.941889887	1.033591354
N702	1.378663480	.025656468	1.328364297	1.428962663
N703	1.032218673	.017407515	.998091459	1.066345886
N704	1.039184789	.017980565	1.003934118	1.074435461
N706	.984998215	.014049693	.957453968	1.012542462
N801	1.147125150	.017867356	1.112096423	1.182153876
N803	.997540871	.013821532	.970443931	1.024637811

Appendix 2-A (Continued)

N804	1.042378302	.017903915	1.007277902	1.077478703
N805	1.040022706	.015868784	1.008912155	1.071133258
N806	.987855600	.015244026	.957969878	1.017741322
N807	.998794266	.014252364	.970852685	1.026735846
N808	1.011157474	.018021539	.975826474	1.046488474
N809	1.022783049	.013959761	.995415112	1.050150985
N810	1.036456636	.022069554	.993189553	1.079723720
N811	.964611349	.014354931	.936468687	.992754011
N812	.999316649	.014352702	.971178357	1.027454941
N814	1.090940829	.020044408	1.051644018	1.130237641
N815	.974929710	.017471676	.940676709	1.009182712
N816	.973017456	.016698578	.940280103	1.005754808
N902	1.061660068	.022760681	1.017038039	1.106282097
N903	.921464749	.018426465	.885339896	.957589602
N904	1.031102478	.014631522	1.002417563	1.059787394
N1701	.996098438	.015755802	.965209386	1.026987491
N1702	.994215476	.022567620	.949971941	1.038459012
N1703	.959745050	.024638141	.911442284	1.008047817
N1704	.963475726	.020714394	.922865417	1.004086036
N1705	.979399852	.021989650	.936289419	1.022510286
N1706	.975860953	.024004444	.928800541	1.022921364
N1707	.982199549	.014625214	.953526999	1.010872098
N1708	1.065680561	.019165308	1.028107216	1.103253907
N1709	1.058849966	.021216894	1.017254512	1.100445420
N1710	1.045689392	.020111819	1.006260423	1.085118361
N1711	1.031031600	.014837137	1.001943579	1.060119620
N1712	1.422615385	.024028128	1.375508542	1.469722228
N1713	.876157673	.029478207	.818366018	.933949329
N1715	1.016815651	.014084914	.989202354	1.044428949
N1801	1.041954291	.014481258	1.013563966	1.070344615
N1802	1.083317479	.014750263	1.054399773	1.112235186
N1803	.985489850	.020379439	.945536215	1.025443485
N1804	1.508325051	.025373993	1.458579656	1.558070446
N1805	1.105209188	.017922125	1.070073087	1.140345289
N1806	1.273074293	.019907052	1.234046766	1.312101819
N1807	1.218355102	.017403959	1.184234858	1.252475347
N1808	1.091534352	.021228550	1.049916047	1.133152658
N1809	1.095945257	.016278637	1.064031193	1.127859322
N1810	1.025345186	.019943669	.986245872	1.064444499
N1811	1.363696381	.019417443	1.325628728	1.401764034
N1813	1.095823853	.017032467	1.062431914	1.129215792
N1814	1.257790487	.019965932	1.218647528	1.296933447
N1815	1.028277724	.013896420	1.001033966	1.055521482
N1816	1.077811616	.024038305	1.030684821	1.124938411
N2901	1.299228209	.022729381	1.254667542	1.343788876
N3001	1.467330124	.021587236	1.425008618	1.509651630
N3004	1.385393718	.023087931	1.340130118	1.430657318
BLV	71005.560760	2990.3143949	65143.086900	76868.034619
LSIZ_EXP	.236524585	.014021392	.209035822	.264013349

Appendix 2-B
Results of Nonlinear MRA for Traditional Feedback Model Structure: Edmonton (Clareview Market Area) - Improved Sales

Nonlinear Regression Summary Statistics   Dependent Variable SALE_PRI

Source	DF	Sum of Squares	Mean Square
Regression	61	5.607536E+13	919268162984
Residual	3421	319801122771	93481766.3755
Uncorrected Total	3482	5.639516E+13	
(Corrected Total)	3481	2701392065422	

R squared = 1 - Residual SS / Corrected SS =   .88162

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
B1	465.93147927	49.900749089	368.09319285	563.76976569
BSMT	118.14396051	27.374896004	64.471160706	171.81676031
BSMTFIN	112.59744517	9.825975409	93.332071125	131.86281922
ATTGAR	592.26182267	30.015981745	533.41075785	651.11288749
DETGAR	354.66779269	20.600077777	314.27809221	395.05749318
FP_MAS	6961.9107121	1007.8212714	4985.9182068	8937.9032173
FP_ZERO	5441.8393327	629.69573946	4207.2215517	6676.4571138
Q5	1.042791267	.009321265	1.024515456	1.061067077
Q6	1.275466909	.024962449	1.226524092	1.324409726
Q7	1.366211049	.050397583	1.267398641	1.465023456
BILEV	.999009858	.015681962	.968262899	1.029756817
SPLITLEV	1.312110197	.060186397	1.194105275	1.430115118
SPLCRWL	1.345233819	.064138753	1.219479682	1.470987957
TWOSTY	.950623792	.026020879	.899605756	1.001641827
BRICK	1.137376896	.078847020	.982784880	1.291968911
TILEROOF	1.144887923	.023266524	1.099270234	1.190505612
PCTGOOD	2.311751848	.140253587	2.036762578	2.586741119
BSIZ_EXP	-.017141568	.088879770	-.191404371	.157121235
LAKE_FAC	1.085604282	.009446772	1.067082397	1.104126167
RIV_FAC	1.034023866	.017279099	1.000145468	1.067902263
RAV_FAC	1.026657826	.015549827	.996169939	1.057145713
PARK_FAC	1.028131995	.011313064	1.005950950	1.050313040
TRAF_FAC	.977687737	.003904169	.970032998	.985342475
COMM_FAC	.986295548	.007710900	.971177113	1.001413984
N2030	.933754553	.010527995	.913112759	.954396347
N2070	.932860693	.010567007	.912142408	.953578977
N2120	.909879956	.020373286	.869934917	.949824995
N2130	.959211313	.011589329	.936488607	.981934020
N2240	.996526610	.010110780	.976702831	1.016350389
N2260	.993327361	.009390356	.974916088	1.011738633
N2280	.926468255	.009644187	.907559305	.945377204
N2320	.918314777	.013993705	.890877912	.945751643
N2340	.983689539	.009217291	.965617587	1.001761491
N2350	.889876439	.012303899	.865752704	.914000173
N2390	.936111698	.009594336	.917300489	.954922907
N2400	1.032002005	.014363528	1.003840044	1.060163965

Appendix 2-B (Continued)

N2430	.918038327	.009573700	.899267579	.936809076
N2440	.998950349	.011674785	.976060093	1.021840605
N2450	.968690587	.007933791	.953135139	.984246036
N2500	1.011911247	.009875077	.992549602	1.031272892
N2510	.987663874	.008258828	.971471140	1.003856608
N2530	.997433428	.009622113	.978567759	1.016299098
N2541	.991639823	.024641468	.943326340	1.039953306
N2580	.996452972	.010879569	.975121861	1.017784083
N2590	.936652721	.012346288	.912445878	.960859564
N2710	.935663295	.015146746	.905965713	.965360878
N2720	.986922237	.009907572	.967496881	1.006347594
N3030	.966164053	.008378544	.949736597	.982591510
N3040	.993746219	.009460459	.975197498	1.012294941
N3060	.967570098	.009056255	.949813882	.985326314
N3080	1.004220946	.012266556	.980170430	1.028271463
N3090	.961739837	.009663604	.942792818	.980686855
N3150	.989271818	.011272464	.967170375	1.011373261
N3180	.944472990	.008249341	.928298856	.960647124
N3190	1.021249165	.011658382	.998391068	1.044107262
N3280	.947123881	.009684896	.928135115	.966112648
N3320	.996827114	.010803570	.975645012	1.018009217
BLV	63780.467094	3571.8310217	56777.329207	70783.604981
LSIZ_EXP	.189178453	.019058199	.151811849	.226545058
TIMEFAC	1.002174414	.000128447	1.001922572	1.002426255
WINT_FAC	.978820842	.003117748	.972708006	.984933679

Appendix 2-C
Results of Nonlinear MRA for Traditional Feedback Model Structure: Ada County (Boise) - Improved Sales

Nonlinear Regression Summary Statistics   Dependent Variable SALE_PRI

Source	DF	Sum of Squares	Mean Square
Regression	43	3.164883E+14	7360193188100
Residual	12778	6085696186901	476263592.651
Uncorrected Total	12821	3.225740E+14	
(Corrected Total)	12820	6.659406E+13	

R squared = 1 - Residual SS / Corrected SS = .90862

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
B1	42.159909822	.757667625	40.674767889	43.645051754
BSMTFIN	25.577486253	.708274354	24.189162522	26.965809984
BSMTUNF	14.896730134	.984106659	12.967733807	16.825726462
LWRUNF	27.947979966	1.756729605	24.504527037	31.391432895
PORCH	16.009799351	2.401687055	11.302133300	20.717465402
PATIO	10.187519584	1.329845584	7.580823222	12.794215945
DECK	11.569159098	1.613285683	8.406877725	14.731440472
GARAGE	17.979554868	1.009334917	16.001107379	19.958002357
POOL	24.240710391	2.114856141	20.095275858	28.386144924
FIREPLAC	3363.8881135	386.98284381	2605.3438258	4122.4324011
QUAL3	.932203607	.010881272	.910874684	.953532529
QUAL5	1.179279429	.006536571	1.166466771	1.192092087
QUAL6	1.430915449	.010985600	1.409382028	1.452448869
QUAL7	1.837639241	.018495996	1.801384320	1.873894161
TWOSTY	.821937601	.007240390	.807745354	.836129849
SPLITLV	.983325521	.004590415	.974327621	.992323422
TRILEVL	.804586333	.011562453	.781922194	.827250471
SIMP_SHP	.942244498	.009085558	.924435445	.960053551
IRRG_SHP	1.020785491	.005262998	1.010469228	1.031101755
CPLX_SHP	1.144243796	.007729020	1.129093760	1.159393833
PREM_RF	1.057638868	.005427550	1.047000059	1.068277677
AC	1.100494554	.008682616	1.083475327	1.117513781
PCTGOOD	.381765352	.019638507	.343270939	.420259766
REMODEL	.194766908	.046851937	.102930099	.286603716
MLS100	1.203762587	.007582083	1.188900570	1.218624603
MLS200	1.193744679	.009346308	1.175424516	1.212064841
MLS300	1.125023147	.005641693	1.113964585	1.136081710
MLS400	1.027296321	.008315981	1.010995754	1.043596887
MLS500	.990140096	.006877352	.976659457	1.003620735
MLS550	.992186099	.008551707	.975423474	1.008948724
MLS600	.994608873	.008002564	.978922649	1.010295097
MLS700	1.036469848	.046720965	.944889763	1.128049932
MLS750	1.095051449	.014762568	1.066114608	1.123988291
MLS800	1.091629582	.006320705	1.079240054	1.104019111
MLS900	1.069625343	.005259042	1.059316834	1.079933851
MLS1000	1.014920553	.007447958	1.000321441	1.029519666

Appendix 2-C (Continued)

MLS1010	1.001775719	.014688683	.972983702	1.030567736
MLS1020	1.003749956	.006109965	.991773509	1.015726402
MLS1030	.962140874	.005846841	.950680190	.973601558
MLS1100	.965575899	.009883592	.946202581	.984949218
BLV	30263.312483	978.10403021	28346.082206	32180.542760
LSIZ_EXP	.337045903	.008784251	.319827457	.354264349
TIMEFAC	1.003325891	.000182227	1.002968699	1.003683083

Appendix 3-A
Results of Nonlinear MRA for Traditional Feedback Model Structure: Jefferson County (Area 4) - Improved and Vacant Sales

Nonlinear Regression Summary Statistics   Dependent Variable SALE_PRI

Source	DF	Sum of Squares	Mean Square
Regression	85	2.052175E+14	2414323339472
Residual	4533	1411932161544	311478526.703
Uncorrected Total	4618	2.066294E+14	
(Corrected Total)	4617	3.445049E+13	

R squared = 1 - Residual SS / Corrected SS =   .95902

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
B1	45.248290998	2.321204983	40.697597748	49.798984249
BSMT	10.255385575	1.001797083	8.291374960	12.219396189
BSMTFIN	9.812872089	.769694192	8.303896281	11.321847898
PORCH_SF	17.373544972	2.572122665	12.330930753	22.416159192
BALC_SF	10.943130917	2.058229237	6.907998316	14.978263517
GARAGE	19.445162062	2.608288689	14.331644807	24.558679316
WALK_OUT	6755.0278643	912.22771253	4966.6168773	8543.4388513
BATH	2999.9743925	820.43125386	1391.5292112	4608.4195738
FIREPLAC	2476.7529649	612.58074091	1275.7961068	3677.7098230
POOL	12651.096349	2746.5338768	7266.5511369	18035.641560
QUAL2	.942547970	.024174530	.895154107	.989941833
QUAL4	1.197403614	.014128258	1.169705342	1.225101886
QUAL5	1.315568517	.021629658	1.273163844	1.357973190
BI	.791409025	.027031796	.738413528	.844404521
STY2	.885247297	.012211611	.861306587	.909188006
SPLT	.897217463	.014809052	.868184501	.926250425
AC	1.031741392	.007307206	1.017415707	1.046067077
BRICK	1.028324924	.009511219	1.009678298	1.046971549
PCTGOOD	1.579814478	.057106901	1.467857114	1.691771842
BSIZ_EXP	.000752690	.042549251	-.082664583	.084169963
TRAF_FAC	.909922012	.009389186	.891514631	.928329394
VIEW_FAC	1.111753174	.011118220	1.089956042	1.133550306
WATERFAC	2.103584886	.078208550	1.950258004	2.256911767
GOLF_FAC	1.196162274	.039599130	1.118528676	1.273795872
OPEN_FAC	1.089478635	.013273255	1.063456584	1.115500686
PARK_FAC	1.275235163	.056842720	1.163795724	1.386674602
COMM_FAC	.898542850	.036623676	.826742593	.970343107
SOIL_FAC	.473688711	.055798778	.364295907	.583081515
TIMEFAC	1.005408792	.000188217	1.005039794	1.005777790
N701	.987740621	.023387415	.941889887	1.033591354
N702	1.378663480	.025656468	1.328364297	1.428962663
N703	1.032218673	.017407515	.998091459	1.066345886
N704	1.039184789	.017980565	1.003934118	1.074435461
N706	.984998215	.014049693	.957453968	1.012542462
N801	1.147125150	.017867356	1.112096423	1.182153876
N803	.997540871	.013821532	.970443931	1.024637811

Appendix 3-A (Continued)

N804	1.042378302	.017903915	1.007277902	1.077478703
N805	1.040022706	.015868784	1.008912155	1.071133258
N806	.987855600	.015244026	.957969878	1.017741322
N806	.987855600	.015244026	.957969878	1.017741322
N807	.998794266	.014252364	.970852685	1.026735846
N808	1.011157474	.018021539	.975826474	1.046488474
N809	1.022783049	.013959761	.995415112	1.050150985
N810	1.036456636	.022069554	.993189553	1.079723720
N811	.964611349	.014354931	.936468687	.992754011
N812	.999316649	.014352702	.971178357	1.027454941
N814	1.090940829	.020044408	1.051644018	1.130237641
N815	.974929710	.017471676	.940676709	1.009182712
N816	.973017456	.016698578	.940280103	1.005754808
N902	1.061660068	.022760681	1.017038039	1.106282097
N903	.921464749	.018426465	.885339896	.957589602
N904	1.031102478	.014631522	1.002417563	1.059787394
N1701	.996098438	.015755802	.965209386	1.026987491
N1702	.994215476	.022567620	.949971941	1.038459012
N1703	.959745050	.024638141	.911442284	1.008047817
N1704	.963475726	.020714394	.922865417	1.004086036
N1705	.979399852	.021989650	.936289419	1.022510286
N1706	.975860953	.024004444	.928800541	1.022921364
N1707	.982199549	.014625214	.953526999	1.010872098
N1708	1.065680561	.019165308	1.028107216	1.103253907
N1709	1.058849966	.021216894	1.017254512	1.100445420
N1710	1.045689392	.020111819	1.006260423	1.085118361
N1711	1.031031600	.014837137	1.001943579	1.060119620
N1712	1.422615385	.024028128	1.375508542	1.469722228
N1713	.876157673	.029478207	.818366018	.933949329
N1715	1.016815651	.014084914	.989202354	1.044428949
N1801	1.041954291	.014481258	1.013563966	1.070344615
N1802	1.083317479	.014750263	1.054399773	1.112235186
N1803	.985489850	.020379439	.945536215	1.025443485
N1804	1.508325051	.025373993	1.458579656	1.558070446
N1805	1.105209188	.017922125	1.070073087	1.140345289
N1806	1.273074293	.019907052	1.234046766	1.312101819
N1807	1.218355102	.017403959	1.184234858	1.252475347
N1808	1.091534352	.021228550	1.049916047	1.133152658
N1809	1.095945257	.016278637	1.064031193	1.127859322
N1810	1.025345186	.019943669	.986245872	1.064444499
N1811	1.363696381	.019417443	1.325628728	1.401764034
N1813	1.095823853	.017032467	1.062431914	1.129215792
N1814	1.257790487	.019965932	1.218647528	1.296933447
N1815	1.028277724	.013896420	1.001033966	1.055521482
N1816	1.077811616	.024038305	1.030684821	1.124938411
N2901	1.299228209	.022729381	1.254667542	1.343788876
N3001	1.467330124	.021587236	1.425008618	1.509651630
N3004	1.385393718	.023087931	1.340130118	1.430657318
BLV	71005.560760	2990.3143949	65143.086900	76868.034619
LSIZ_EXP	.236524585	.014021392	.209035822	.264013349

Appendix 3-B
Results of Nonlinear MRA for Traditional Feedback Model Structure: Edmonton (Clareview Market Area) - Improved and Vacant Sales

Nonlinear Regression Summary Statistics   Dependent Variable SALE_PRI

Source	DF	Sum of Squares	Mean Square
Regression	61	5.607536E+13	919268162984
Residual	3421	319801122771	93481766.3755
Uncorrected Total	3482	5.639516E+13	
(Corrected Total)	3481	2701392065422	

R squared = 1 - Residual SS / Corrected SS =   .88162

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
B1	465.93147927	49.900749089	368.09319285	563.76976569
BSMT	118.14396051	27.374896004	64.471160706	171.81676031
BSMTFIN	112.59744517	9.825975409	93.332071125	131.86281922
ATTGAR	592.26182267	30.015981745	533.41075785	651.11288749
DETGAR	354.66779269	20.600077777	314.27809221	395.05749318
FP_MAS	6961.9107121	1007.8212714	4985.9182068	8937.9032173
FP_ZERO	5441.8393327	629.69573946	4207.2215517	6676.4571138
Q5	1.042791267	.009321265	1.024515456	1.061067077
Q6	1.275466909	.024962449	1.226524092	1.324409726
Q7	1.366211049	.050397583	1.267398641	1.465023456
BILEV	.999009858	.015681962	.968262899	1.029756817
SPLITLEV	1.312110197	.060186397	1.194105275	1.430115118
SPLCRWL	1.345233819	.064138753	1.219479682	1.470987957
TWOSTY	.950623792	.026020879	.899605756	1.001641827
BRICK	1.137376896	.078847020	.982784880	1.291968911
TILEROOF	1.144887923	.023266524	1.099270234	1.190505612
PCTGOOD	2.311751848	.140253587	2.036762578	2.586741119
BSIZ_EXP	-.017141568	.088879770	-.191404371	.157121235
LAKE_FAC	1.085604282	.009446772	1.067082397	1.104126167
RIV_FAC	1.034023866	.017279099	1.000145468	1.067902263
RAV_FAC	1.026657826	.015549827	.996169939	1.057145713
PARK_FAC	1.028131995	.011313064	1.005950950	1.050313040
TRAF_FAC	.977687737	.003904169	.970032998	.985342475
COMM_FAC	.986295548	.007710900	.971177113	1.001413984
N2030	.933754553	.010527995	.913112759	.954396347
N2070	.932860693	.010567007	.912142408	.953578977
N2120	.909879956	.020373286	.869934917	.949824995
N2130	.959211313	.011589329	.936488607	.981934020
N2240	.996526610	.010110780	.976702831	1.016350389
N2260	.993327361	.009390356	.974916088	1.011738633
N2280	.926468255	.009644187	.907559305	.945377204
N2320	.918314777	.013993705	.890877912	.945751643
N2340	.983689539	.009217291	.965617587	1.001761491
N2350	.889876439	.012303899	.865752704	.914000173
N2390	.936111698	.009594336	.917300489	.954922907
N2400	1.032002005	.014363528	1.003840044	1.060163965

Appendix 3-B (Continued)

N2430	.918038327	.009573700	.899267579	.936809076
N2440	.998950349	.011674785	.976060093	1.021840605
N2450	.968690587	.007933791	.953135139	.984246036
N2500	1.011911247	.009875077	.992549602	1.031272892
N2510	.987663874	.008258828	.971471140	1.003856608
N2530	.997433428	.009622113	.978567759	1.016299098
N2541	.991639823	.024641468	.943326340	1.039953306
N2580	.996452972	.010879569	.975121861	1.017784083
N2590	.936652721	.012346288	.912445878	.960859564
N2710	.935663295	.015146746	.905965713	.965360878
N2720	.986922237	.009907572	.967496881	1.006347594
N3030	.966164053	.008378544	.949736597	.982591510
N3040	.993746219	.009460459	.975197498	1.012294941
N3060	.967570098	.009056255	.949813882	.985326314
N3080	1.004220946	.012266556	.980170430	1.028271463
N3090	.961739837	.009663604	.942792818	.980686855
N3150	.989271818	.011272464	.967170375	1.011373261
N3180	.944472990	.008249341	.928298856	.960647124
N3190	1.021249165	.011658382	.998391068	1.044107262
N3280	.947123881	.009684896	.928135115	.966112648
N3320	.996827114	.010803570	.975645012	1.018009217
BLV	63780.467094	3571.8310217	56777.329207	70783.604981
LSIZ_EXP	.189178453	.019058199	.151811849	.226545058
TIMEFAC	1.002174414	.000128447	1.001922572	1.002426255
WINT_FAC	.978820842	.003117748	.972708006	.984933679

Appendix 3-C
Results of Nonlinear MRA for Traditional Feedback Model Structure: Ada County (Boise) - Improved and Vacant Sales

Nonlinear Regression Summary Statistics   Dependent Variable SALE_PRI

Source	DF	Sum of Squares	Mean Square
Regression	43	3.164883E+14	7360193188100
Residual	12778	6085696186901	476263592.651
Uncorrected Total	12821	3.225740E+14	
(Corrected Total)	12820	6.659406E+13	

R squared = 1 - Residual SS / Corrected SS =   .90862

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
B1	42.159909822	.757667625	40.674767889	43.645051754
BSMTFIN	25.577486253	.708274354	24.189162522	26.965809984
BSMTUNF	14.896730134	.984106659	12.967733807	16.825726462
LWRUNF	27.947979966	1.756729605	24.504527037	31.391432895
PORCH	16.009799351	2.401687055	11.302133300	20.717465402
PATIO	10.187519584	1.329845584	7.580823222	12.794215945
DECK	11.569159098	1.613285683	8.406877725	14.731440472
GARAGE	17.979554868	1.009334917	16.001107379	19.958002357
POOL	24.240710391	2.114856141	20.095275858	28.386144924
FIREPLAC	3363.8881135	386.98284381	2605.3438258	4122.4324011
QUAL3	.932203607	.010881272	.910874684	.953532529
QUAL5	1.179279429	.006536571	1.166466771	1.192092087
QUAL6	1.430915449	.010985600	1.409382028	1.452448869
QUAL7	1.837639241	.018495996	1.801384320	1.873894161
TWOSTY	.821937601	.007240390	.807745354	.836129849
SPLITLV	.983325521	.004590415	.974327621	.992323422
TRILEVL	.804586333	.011562453	.781922194	.827250471
SIMP_SHP	.942244498	.009085558	.924435445	.960053551
IRRG_SHP	1.020785491	.005262998	1.010469228	1.031101755
CPLX_SHP	1.144243796	.007729020	1.129093760	1.159393833
PREM_RF	1.057638868	.005427550	1.047000059	1.068277677
AC	1.100494554	.008682616	1.083475327	1.117513781
PCTGOOD	.381765352	.019638507	.343270939	.420259766
REMODEL	.194766908	.046851937	.102930099	.286603716
MLS100	1.203762587	.007582083	1.188900570	1.218624603
MLS200	1.193744679	.009346308	1.175424516	1.212064841
MLS300	1.125023147	.005641693	1.113964585	1.136081710
MLS400	1.027296321	.008315981	1.010995754	1.043596887
MLS500	.990140096	.006877352	.976659457	1.003620735
MLS550	.992186099	.008551707	.975423474	1.008948724
MLS600	.994608873	.008002564	.978922649	1.010295097
MLS700	1.036469848	.046720965	.944889763	1.128049932
MLS750	1.095051449	.014762568	1.066114608	1.123988291
MLS800	1.091629582	.006320705	1.079240054	1.104019111
MLS900	1.069625343	.005259042	1.059316834	1.079933851
MLS1000	1.014920553	.007447958	1.000321441	1.029519666

Appendix 3-C (Continued)

MLS1010	1.001775719	.014688683	.972983702	1.030567736
MLS1020	1.003749956	.006109965	.991773509	1.015726402
MLS1030	.962140874	.005846841	.950680190	.973601558
MLS1100	.965575899	.009883592	.946202581	.984949218
BLV	30263.312483	978.10403021	28346.082206	32180.542760
LSIZ_EXP	.337045903	.008784251	.319827457	.354264349
TIMEFAC	1.003325891	.000182227	1.002968699	1.003683083