What Drives Land Prices in Your Market? The Use of Multiple Regression Analysis to Confirm the Significance of Determinative Real Estate Value Elements

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Abstract

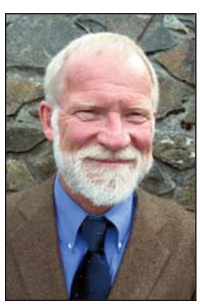
Multiple regression analysis (MRA) has proven to be a useful tool to predict selling prices in a mass appraisal context. The significance of determinative value elements – identified by more conventional methods such as sale verification or pairings – can objectively be confirmed or rejected by the practicing appraiser employing MRA. This is demonstrated with the analysis of a small set of sales of rural lots in southeast Alaska.

This article aims to:

- Demonstrate the strength of MRA to *explain* rather than to *predict* selling price or value of real estate in dynamic markets;
- Encourage an increased use of regression techniques properly applied by those who are familiar with MRA but do not routinely use statistical methods; and
- Show the usefulness of MRA in supporting area market trends, in the selection of comparable sales and in the application of qualitative adjustments for difficult-to-quantify property attributes in specific appraisal assignments.

Introduction

Experienced real estate appraisers have a good understanding of market forces and value elements that influence selling prices of real property in their field of professional practice. However, there is the danger that after years of appraising, complacency sets in and reveals itself with the tendency to replicate trends and adjustments without in-depth analysis. Hence, the professional practitioner may find it necessary to periodically step outside the box of everyday routine and objectively analyze data sets to independently confirm value trends and the significance of value determinants. The capability of easy- to-use statistical software to perform ordinary least-square (OLS) multiple regression analysis (MRA) has made it relatively simple for an appraiser with a small, busy practice to confirm or reject the significance of value influences perceived in the marketplace. Not all of the electronic spreadsheets in use allow for the adequate testing of the statistical model; hence, it is important that the appraiser select appropriate statistical software to complete the MRA. The analysis of a data set of 46 sales of unimproved rural residential lots on Prince of Wales Island in southeast Alaska is used to demonstrate development and testing of a regression model with the objective to explain which property attributes influence value at what magnitude. The practical result shows how an appraiser can take advantage of the explanatory power of MRA to objectively support area market trends, to justify the selection of comparable sales based on the significance of determinative property attributes and to support qualitative adjustments in appraisal assignments where a concise quantification with sale pairings is not an option.



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Regression Theory

The merits of MRA have been long recognized, discussed and explained in the appraisal literature (e.g. Patterson, 2006), dissertations (e.g., Wild, 1993) and textbooks (e.g., Anderson, Sweeney, & Williams, 2004). The reader is encouraged to consult these and other sources for an in-depth discussion of regression theory and application. In mass appraisal assignments, MRA has proven to be a useful tool for predicting selling prices for real estate of a relatively homogenous type in an efficient market. The importance of adequate testing of the stability of the model and potential pitfalls has been emphasized early on by many authors (e.g. Murphy, 1989). For many practitioners outside of the mass appraisal field, MRA is more useful to explain rather than predict value (Postier et al., 1992). It provides an analytical tool to objectively support the significance of value determinants observed in the market through sale verification or the pairing of sales, and allows for testing of value determinants that are often overlooked in conventional sales analysis.[1] In the standard Multiple Regression Model

$$y = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots + \beta_p x_p + \varepsilon \qquad (1)$$

the appraiser's main focus is not on the dependent variable (y), but on the coefficients (β) of the independent or explanatory variables (x), those tangible and intangible property attributes that determine value.[2]

The analyst has to be knowledgeable about reliability and limitation of MRA[3] and cognizant of the assumptions about randomness and independence of the error term (ε) of the OLS model.[4]

Data Set and Appraiser's Hypothesis

A data set consisting of 46 sales of unimproved rural residential lots on Prince of Wales Island in southeast Alaska is employed to demonstrate the use of MRA to objectively confirm or reject the significance of value determinants observed through interviews with market participants. The data set is presented in Table 1. The sales transacted over a nine-year time period and involved rural lots ranging from 1.1 acres to 3.5 acres in size. About one-quarter of the sales have 150 feet to 350 feet per lot ocean front; the remaining lots are backland sites located near the waterfront. Some of the sales are located on the west side, while others are on the east side of the island where fishing is reported by some of the market participants to be inferior. Thirteen transactions are direct sales based on appraisals, while the remaining thirty-three are lots sold by progressive online auctions with minimum bid prices supported by appraisals. Land sale by online auction and direct sale are both common and well-accepted marketing methods for this type of rural real estate in Alaska, and general market observations suggest online auction sales result in higher sale prices. To prevent introduction of subjectivity, none of the sales that appear to be outliers are eliminated. The hypothesis is that those value elements identified in the sale verification process are significant: The sale price of a lot increases as a function of a more recent *sale date*, a *location* on the west side of the island where fishing is reported to be superior, increasing *size*, increasing *water front* and *sale method* by auction. Concurrently it is hypothesized that most of the change in selling price is explained by a change in these five variables.

This hypothesis requires testing the following model:

$$\text{Price (\$)} = \beta_o + \beta_1 \text{time} + \beta_2 \text{location} + \beta_3 \text{size} + \beta_4 \text{waterfront} + \beta_5 \text{sale method} \qquad (2)$$

where

price is the dependent variable, the predicted sale price or value for a lot in $;

β_o is the regression constant to be computed;

$\beta_1 \beta_2 \beta_3 \beta_4 \beta_5$ are the coefficients to be computed for the independent or explanatory variables time, location, size, waterfront and sale method;

time is the independent variable expressed as a negative number of years ago the sale occurred;

location is a qualitative binary variable,[5] 0 is used for the east shore and 1 for the west shore of the island;

size is the independent variable for size of the lot, expressed in acres;

waterfront is expressed in front-feet for the individual lot, or alternatively as a binary variable with 0 indicating the absence and 1 the presence of waterfront;

sale method is a qualitative binary variable, 0 is used for a direct sale and 1 for a sale by progressive online auction.

Results

The multiple regression model is analyzed with commercially available statistical software.[6] Since the objective is to find a model with explanatory variables (property attributes) that adequately explain the sale price, the appraiser has to experiment with different sets of property attributes and different functional forms of the regression equation. For the initial model, it is recommended to include all property attributes that are suspected to influence the price. The confidence level chosen for testing the significance of the influence the individual property attributes exert on sale price is selected at 95 percent ($\alpha =< 0.05$).[7] The following process illustrates a possible approach to find a model with suitable specifications to solve the example problem:

In a first step, the appraiser tests a linear regression model. The equation tested and the regression results are shown in Figure 1. Comparing the *p-values* for the explanatory variables (property attributes) with the analyst's predetermined confidence level ($\alpha =< 0.05$) the linear model shows no statistical significance of any of the independent variables ($p > 0.05$) except for waterfront.[8] The relationship between *price* and *location* is particularly insignificant ($p = 0.57$).

In the second step, the model is refit in Regression Equation 2, shown in Figure 2, dropping the variable location. As a result, all determinative value elements except for the regression constant (p=0.291) become significant at the predetermined confidence level, and the coefficient of determination R-Sq (adj)[9] is slightly increased from 75.3 percent in Equation 1 to 75.6 percent in Equation 2. A visual examination of the residual plots in Figure 2 indicates skewness in the "Normal Probability Plot of the Residuals".[10]

In a third step, to address possible nonlinearities, the functional form of the model is changed. Logarithmic transformation[11] of *price* and *size* results in the improved Regression Equation 3, shown in Figure 3. The explanatory variables *time*, *waterfront*, *size* and the *method of sale* have coefficients that are significant at the predetermined confidence level. The significance of *location* ($p = 0.055$) remains below the selected confidence level ($\alpha =< 0.05$).

In a fourth step, the log-linear model is recomputed after dropping the explanatory variable location. Regression Equation 4, shown in Figure 4 results in a model that increases the significance of the remaining variables and only slightly reduces the coefficient of determination *R-Sq (adj)*.

It is reasonable to assume that size of a lot and length of waterfront are correlated; larger lots often benefit from longer waterfront. Hence, in a final step, to avoid possible correlation of the explanatory variables, the model is recomputed by replacing *waterfront* with the binary variable *water* (0 indicates the absence; 1 the presence of waterfront). Regression Equation 5, shown in Figure 5, results in a model that adequately explains sale price or value. The adequacy of a model presented as Regression Equation 5 is judged reliable based on the following "rule of thumb" criteria:[12]

1. A careful examination of the direction (sign) of the coefficients is necessary to ensure the final model does not defeat logic and there are no off-setting errors. For example, a model with a negative coefficient for *water* would not make sense in a market that typically pays a premium for water front property.
2. *R-Sq (adj.) = 81.7* percent means the four variables *time, water, size,* and *sale method* explain over 4/5th of the change in *price*.
3. The coefficients of the explanatory variables are strongly significant; the smallest *T-value* is 3.23.[13]
4. The equation is strongly significant in explaining the dependent variable price; the actual *F-value* is 51.35 *(the required F-value is >2.6)*.[14]
5. The graphs in Figure 5 for "Residual Plots for lgprice" show patterns that indicate a reasonably normal distribution of the residuals.[15]
6. Advanced applications of MRA call for a number of additional tests and experimentation with the model specification, including functional form, but are less meaningful or necessary in a practical appraisal problem that focuses on the explanatory powers of MRA.[16]

As shown with the quantifications of adjustments in Table 2, MRA helps the appraiser to accept or reject the hypothesis and identify the relative importance of the value elements:

- Market perception that lots sell for more on the west side of the island because fishing is reportedly superior is not confirmed with objective sale data analysis.
- The annually compounded time adjustment in this market area is 5 percent per year over 9 years. The price-time trend is positive as expected and of a reasonable magnitude relative to rates in other rural real estate market segments.
- The current sale by auction of a 2.12-acre lot (sample mean) with waterfront would command a sale price of $65,553 ("base lot" sale price).
    - o The impact on value of waterfront is very significant as expected. Compared to a backland lot at $34,561, the price for a similar lot with waterfront is almost double. Because of a possible correlation with size, the reliability of the adjustment is not improved by expressing this attribute in

front-feet. Treating the adjustment of waterfront as a binary variable prevents the danger of "double-dipping."

- o The impact of size on price is significant: Large lots sell for a higher price and the price increment with increasing size is declining. Reducing the size of the "base lot" from 2.12 acres (sample data mean) to 1.12 acres (lower end of the sample data range) reduces the lot price from $65,553 to $43,854, or by 33 percent.
- o A conveyance of a similar lot by direct sale rather than online auction would result in a significantly lower price.

While the adjustments quantified with MRA are not available for a direct introduction in the sales comparison approach in a specific appraisal assignment, the results from the example MRA are useful to support subject area market trends, the selection of comparable sales and may provide support for qualitative adjustments. The example MRA supports a stratification of sale data for the sales comparison approach in a specific assignment based on the property attributes *water, time, size* and *sale method*, in the order of significance, while assigning little weight to location.

Conclusion

MRA of small data sets can produce unreliable results in the prediction of real estate selling prices in inefficient rural markets. However, demonstrated with the analysis of unstratified lot sale data, MRA may serve as a useful tool for appraisers to explain selling price or value. The use of MRA to periodically confirm "perceptions" and the appraiser's "experience" has the potential to lend objective support and credibility to appraisal reports. In the example problem, the explanatory power of MRA reveals that in this market the influence of location, a property attribute "assumed" important proves insignificant, whereas the seemingly unimportant value element sale method proves surprisingly significant. Conclusions drawn from a statistical model are only as reliable as the model itself. The ready availability of user-friendly computer software, including electronic spreadsheets, does not relieve the appraiser from adequate testing of the model prior to its application. The process to develop, test and interpret the optimal model is time consuming. However, MRA is believed to be a useful tool to enhance the understanding of property attributes that drive property values. In the example MRA, only a part of the selling price or value is "scientifically" explainable. Interpretation of the unexplained part of the value requires the appraiser's judgment, a confirmation that appraising real estate combines art and science.

Endnotes

1 Examples of value determinates that are often overlooked include season of sale (i.e., month of the year the property sold), buyer origin (i.e., local or out-of-area buyer) and sale method (i.e., auction or negotiated sale).

2 The sales price (y) of a property is explained by property attributes (x_1, x_2, *etc.*), i.e. ,size, waterfront, slope, etc. The magnitude of the influence of the property attributes on price is measured with the coefficients (β_1, β_2, *etc.*). The task of the analyst is to select for testing all those property attributes that are suspected to have a significant influence on value or price. The coefficient β_0 is the regression constant. The residual error ε is the deviation between actual and expected sale price and captures that part of the sales price that is not explained with the property attributes selected.

3 MRA application may lead to meaningless results in inefficient markets typically associated with very unique real estate. Results from MRA mat be unreliable when models are developed with property attributes that are correlated (similar to "double dipping" in a traditional sales comparison approach), when results are not plausible due to offsetting errors, or when models are inadequately tested.

4 The randomness and independence of the residual error is best evaluated with the examination of residual plots produced by the statistical software used. Examples of residual plots are shown in Figures 1-5 and criteria for the evaluation of the plots are described in the "Results" Section of this article.

5 In MRA it is preferable that the appraiser use measurable variables whenever possible, i.e., *size* in acres. However, because many property attributes that significantly influence value are not quantifiable, i.e. a scenic view, the appraiser is forced to introduce qualitative variables, also called dummy variables or binary variables. For example, *sale method* is not a continuously defined variable; to test the potential influence of *sale method* on *price* and to obtain information on the magnitude of this influence, we assign the online auction sale the binary variable 1 and the direct sale the binary variable 0.

6 The statistical software used to solve the example problem is MINITAB. MINITAB® is a registered Trademark of Minitab Inc. Numerous equally suitable and user-friendly statistical software packages are available for MRA and other statistical applications in real estate analysis.

7 A 95% confidence level is recommended for the analysis of rural real estate. The analyst may select a confidence level of 99% (α = < *0.01*) in markets that transact with greater efficiency.

[8] If the *p-value* for a particular explanatory variable is smaller than the confidence level selected by the analyst, the association between the variable and the price is statistically significant, i.e., in Regression Equation 1, Figure 1 for size *p= 0.056*, whereas the selected $\alpha = <$ *0.05* meaning the association between *size* and *price* in this model is not statistically significant at the 95% confidence level.

[9] The coefficient of determination *R-Sq* describes the percentage movement of the dependent variable (sale price) that is explained by the explanatory variables (property attributes). Generally, a higher *R-sq* means a better explanatory power of the regression model. The adjusted *R-sq* is a modified *R-sq* adjusted for the number of independent variables. The use of *R-Sq (adj)* is preferable because it prevents arriving at an artificially high coefficient of determination by introducing unnecessary independent variables in the model. In the example problem *R-Sq (adj)* is reviewed as one of the criteria to judge the reliability of the regression model.

[10] The *Normal Probability Plot of the Residuals* shown in Figure 2 under Residual Plots for Price ideally should follow a straight line. Skewness, meaning a curve in the tails, suggests nonlinearity in the model and encourages the analyst to experiment with the functional form of the regression equation.

[11] The reliability of a regression equation is often improved with a logarithmic transformation of the dependent variable (semi-log model) and the transformation of continuously defined independent variables in addition to the dependent variable (log-linear model).

[12] See computer printout in Figure 5.

[13] The t-statistic (*T-value*) determines the significance of the relationship between a particular explanatory variable (property attribute) and the dependent variable (sale price), or how reliably a particular property attribute explains the sale price. The *T- values* depend on the confidence level selected by the analyst, i.e. 95% in the example problem, and the number of explanatory variables in the model, i.e. 4 in the example, and are obtained from statistical tables. For the example data set a t-value of > 2.8 is acceptable.

[14] The F-statistic (*F-value*) determines the significance of the equation, or how reliably the set of attributes tested explains the purchase price. The *F-value* depends on the number of property attributes in the model and the number of sales in the sample, and is obtained from statistical tables. For the example data set, a F-value of > 2.6 is acceptable.

[15] The *Normal Probability Plot of the Residuals* follows roughly a straight line indicating a normal distribution of the residuals. (Slight curvature in the tails of plots for data sets <50 sales does not mean non-normality.) The pattern of *Residuals versus the Fitted Values* shows the residuals scattered randomly about zero. In comparison to normal probability plots, histograms are less indicative of the normal distribution of the data. The *Histogram of the Residuals* shows a reasonably normal distribution for the small data set analyzed. The *Residuals Versus the Order of the Data* does not indicate a pattern suggesting unreasonable systematic effects due to data collection order. These plots should be compared with the analogous ones in Figure 2 before a nonlinear transformation was applied.

[16] See reference texts; examples are the *Variance Inflation Factor (VIF)* and the *Durbin-Watson statistic*. The stability of the equation can be tested by recomputation of the model after dropping an observation picked at random; this process should not have a significant influence on the coefficients.

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Figure 1. Regression Equation 1 – Linear Model

Price = 9974 + 1245 time + 115 water front + 7775 sale + 7196 size + 2942 location

Expl. Variable	β	SE Coef	T	P	VIF
Constant	9974	9071	1.10	0.278	
time	1245.3	650.3	1.92	0.063	1.7
water front	114.74	16.24	7.07	0.000	1.3
sale	7775	4166	1.87	0.069	1.4
size	7196	3650	1.97	0.056	1.9
location	2942	5138	0.57	0.570	2.1

S = 10906.4   R-Sq = 77.7%   R-Sq(adj) = 74.9%

PRESS = 6149879775   R-Sq(pred) = 71.21%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	16600427097	3320085419	27.91	0.000
Residual Error	40	4758006886	118950172		
Total	45	21358433983			

Durbin-Watson statistic = 1.42259

No evidence of lack of fit (P >= 0.1).

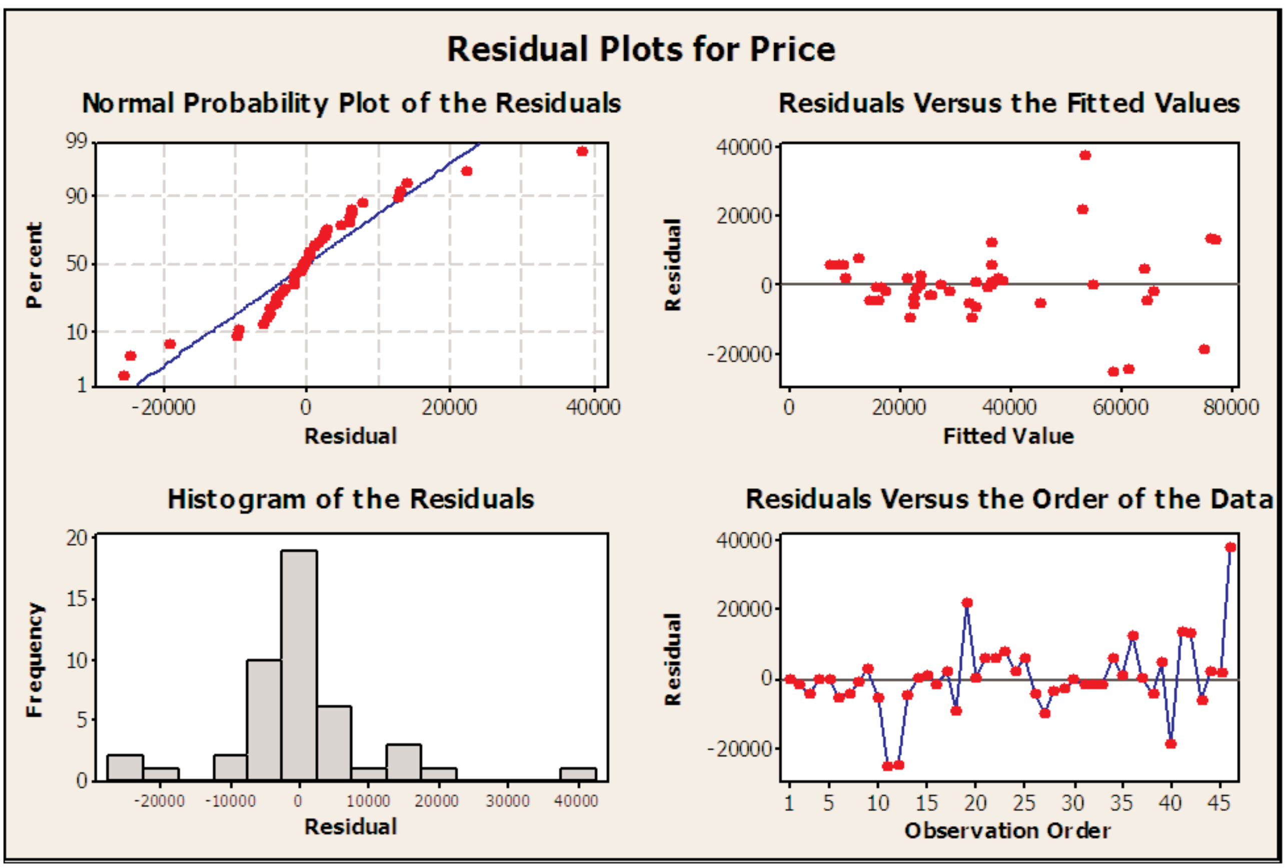

Figure 2. Regression Equation 2 – Linear Model after dropping location

Price = 9607 + 1333 time + 115 water front + 8239 size + 8704 sale

Expl. Variable	β	SE Coef	T	P	VIF
Constant	9607	8974	1.07	0.291	
time	1333.5	626.6	2.13	0.039	1.6
water front	114.73	16.10	7.12	0.000	1.3
size	8239	3136	2.63	0.012	1.5
sale	8704	3806	2.29	0.027	1.2

S = 10816.7   R-Sq = 77.5%   R-Sq(adj) = 75.3%

PRESS = 5981597298   R-Sq(pred) = 71.99%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	4	16561423910	4140355977	35.39	0.000
Residual Error	41	4797010073	117000246		
Total	45	21358433983			

Durbin-Watson statistic = 1.45591

No evidence of lack of fit (P >= 0.1).

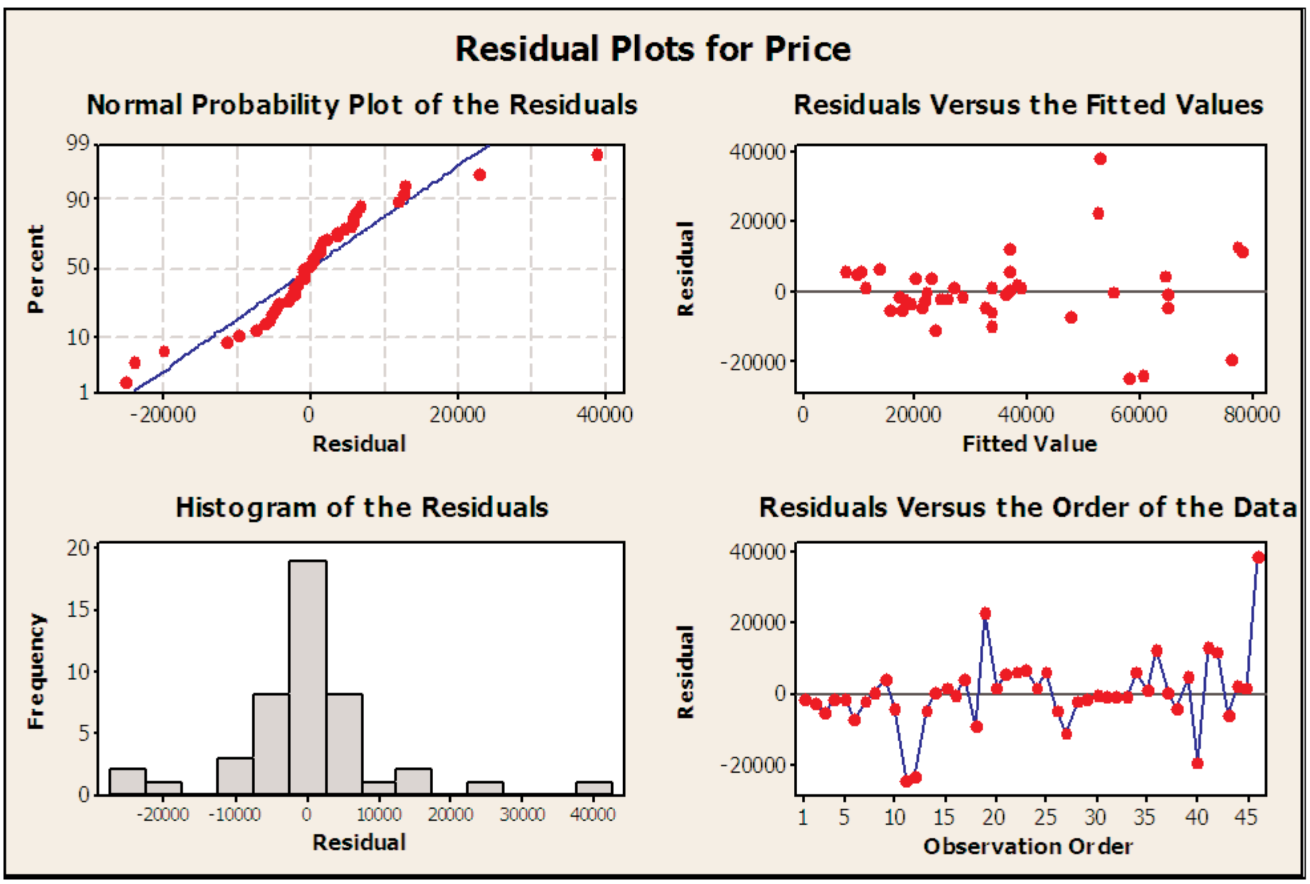

Figure 3. Regression Equation 3 – Log-Linear Model

lgprice = 4.21 + 0.0211 time + 0.00104 water front + 0.395 lgsize + 0.117 sale + 0.103 location

Expl. Variable	β	SE Coef	T	P	VIF
Constant	4.21394	0.07418	56.81	0.000	
time	0.021087	0.006460	3.26	0.002	1.7
water front	0.0010421	0.0001580	6.60	0.000	1.3
lgsize	0.3954	0.1856	2.13	0.039	2.2
sale	0.11706	0.04060	2.88	0.006	1.4
location	0.10283	0.05212	1.97	0.055	2.3

S = 0.106098   R-Sq = 84.6%   R-Sq(adj) = 82.7%

PRESS = 0.585323   R-Sq(pred) = 80.03%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	2.48094	0.49619	44.08	0.000
Residual Error	40	0.45027	0.01126		
Total	45	2.93121			

Durbin-Watson statistic = 1.34478

No evidence of lack of fit (P >= 0.1).

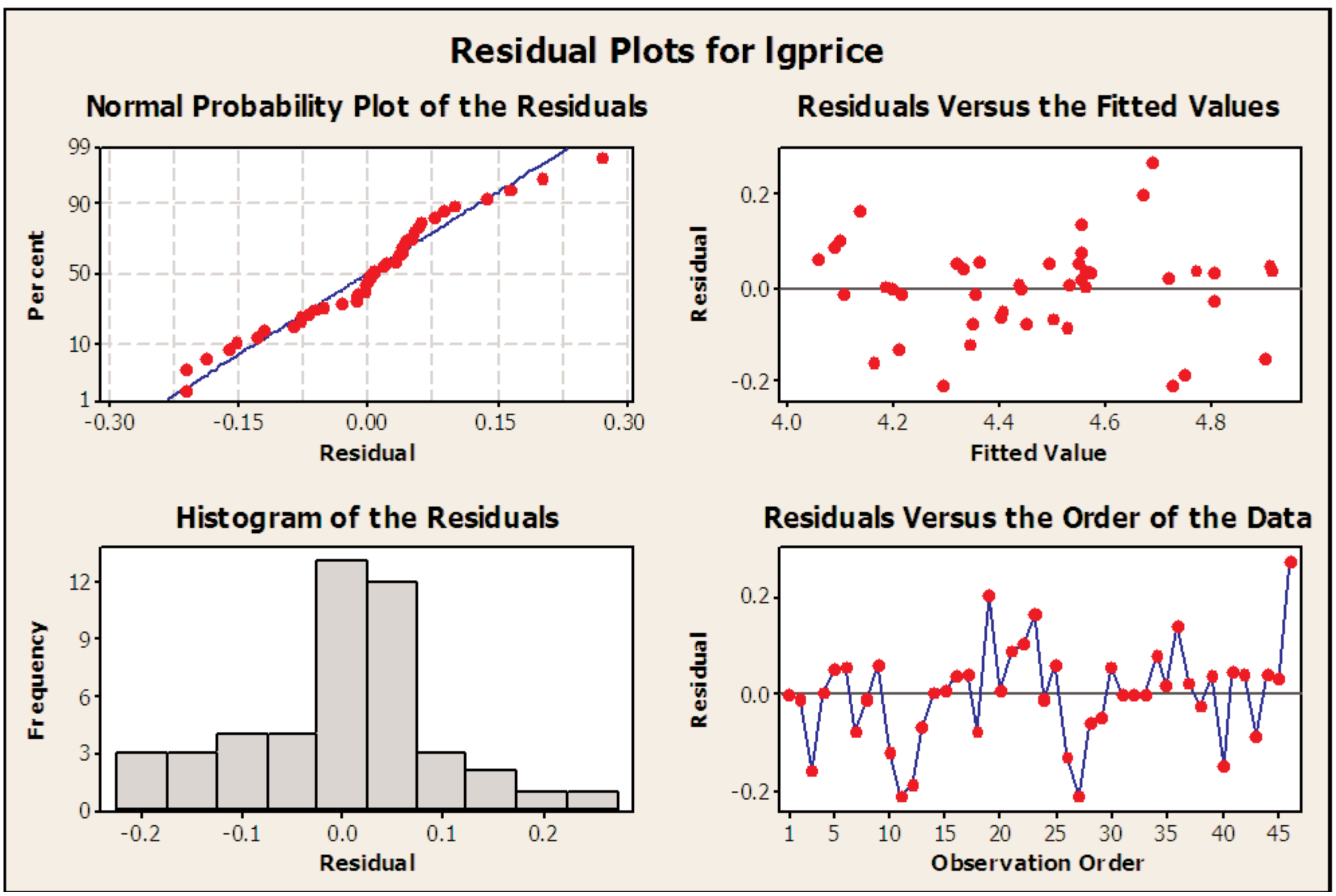

Figure 4. Regression Equation 4 – Log-Linear Model after dropping location

lgprice = 4.21 + 0.0232 time + 0.00105 water front + 0.599 lgsize + 0.148 sale

Expl. Variable	β	SE Coef	T	P	VIF
Constant	4.21131	0.07674	54.88	0.000	
time	0.023186	0.006593	3.52	0.001	1.7
water front	0.0010524	0.0001634	6.44	0.000	1.3
lgsize	0.5991	0.1595	3.76	0.001	1.5
sale	0.14844	0.03865	3.84	0.000	1.2

S = 0.109778   R-Sq = 83.1%   R-Sq(adj) = 81.5%

PRESS = 0.618128   R-Sq(pred) = 78.91%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	4	2.43711	0.60928	50.56	0.000
Residual Error	41	0.49410	0.01205		
Total	45	2.93121			

Durbin-Watson statistic = 1.34984

No evidence of lack of fit (P >= 0.1)

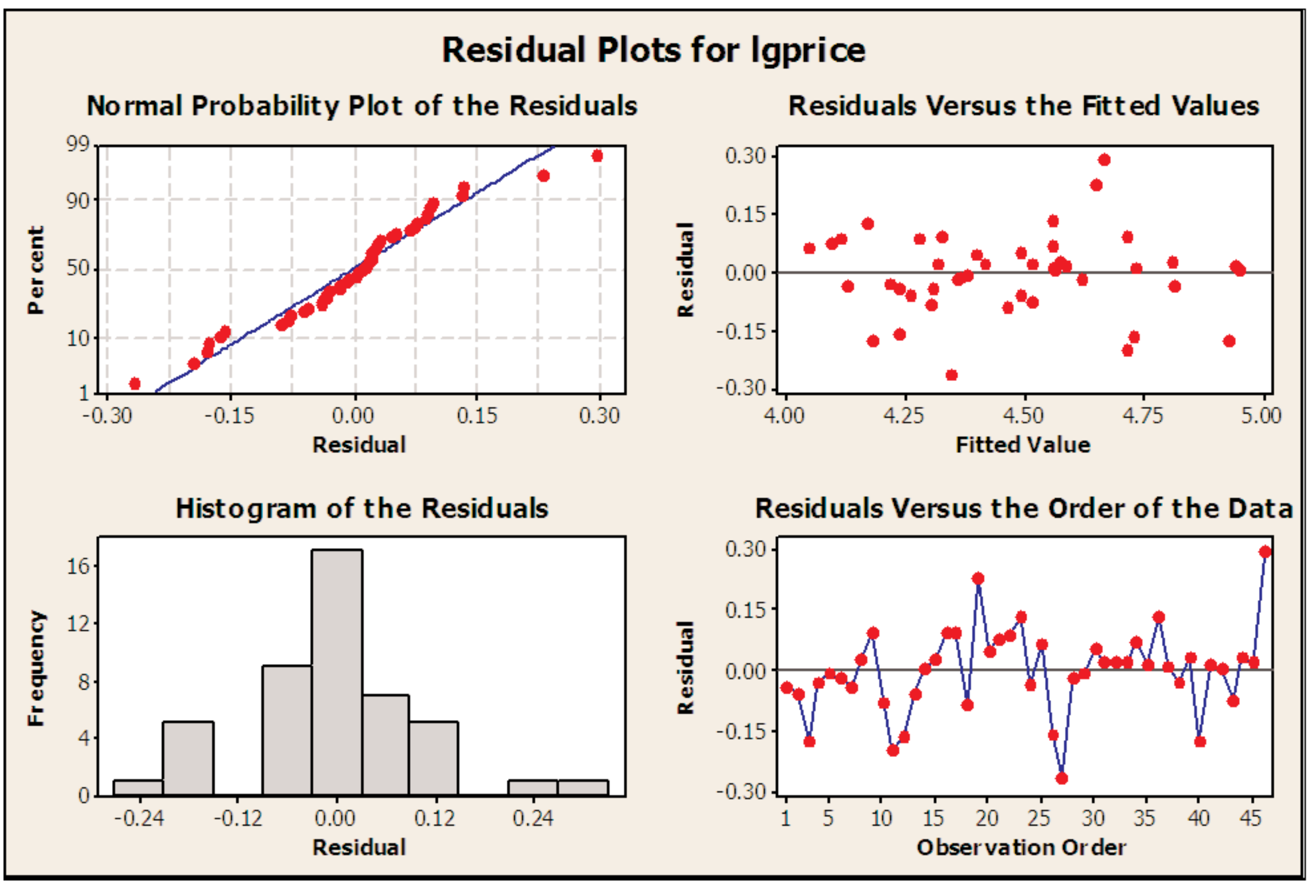

Figure 5. Regression Equation 5 – LogLinear Model with water as binary variable

lgprice = 4.19 + 0.0214 time + 0.278 water + 0.630 lgsize + 0.143 sale

Expl. Variable	β	SE Coef	T	P	VIF
Constant	4.19359	0.07664	54.72	0.000	
time	0.021420	0.006631	3.23	0.002	1.7
water	0.27759	0.04254	6.53	0.000	1.3
lgsize	0.6301	0.1586	3.97	0.000	1.5
sale	0.14274	0.03869	3.69	0.001	1.2

S = 0.109066   R-Sq = 83.4%   R-Sq(adj) = 81.7%

PRESS = 0.629579   R-Sq(pred) = 78.52%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	4	2.44350	0.61088	51.35	0.000
Residual Error	41	0.48771	0.01190		
Total	45	2.93121			

Durbin-Watson statistic = 1.41103

No evidence of lack of fit (P >= 0.1).

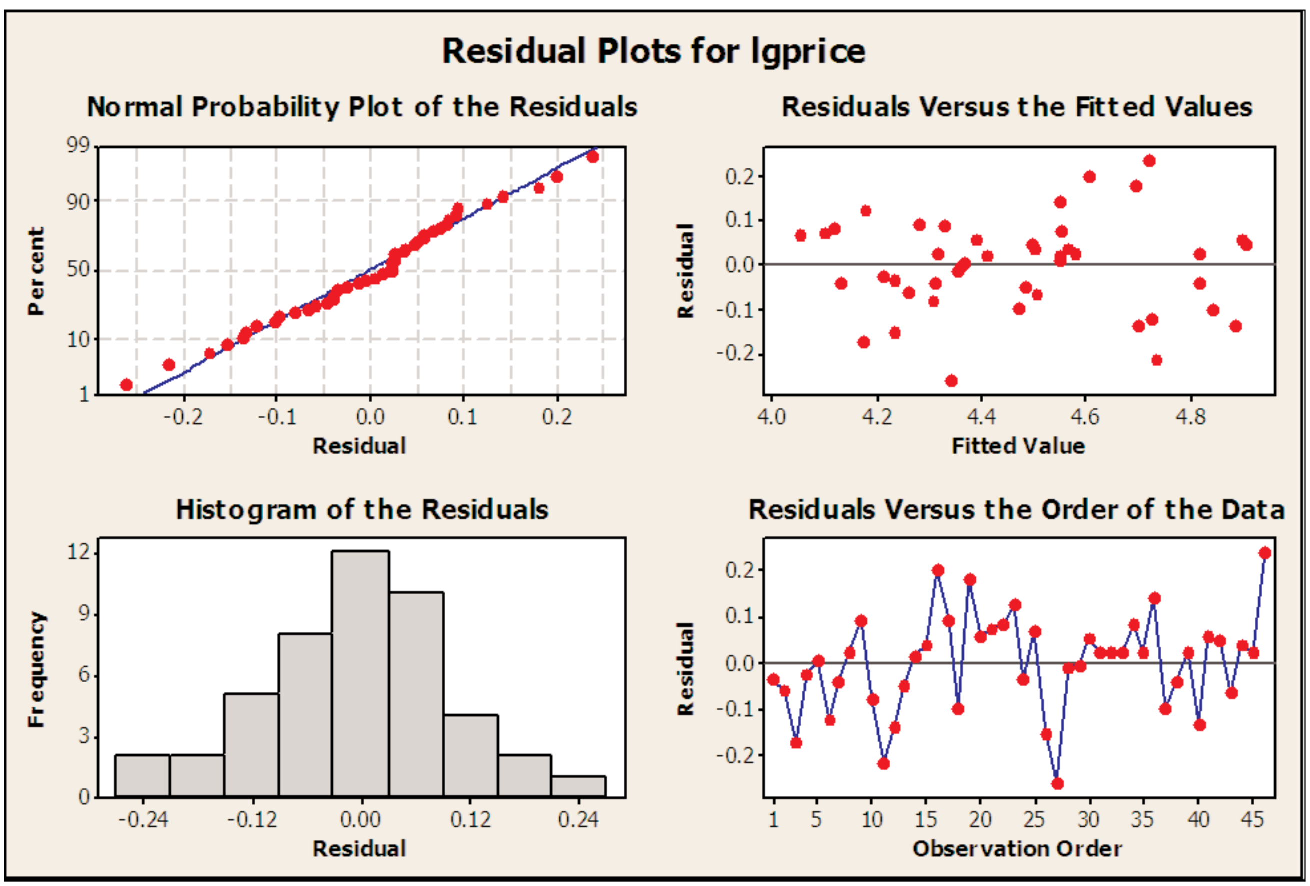

Table 1. Sale data

Sale No.	price *Sale Price ($)*	time *Years Ago*	location *westside = 1 eastside = 0*	size *Lot Size (Acres)*	water front *Saltwater Front Feet*	sale *Auction = 1 Direct = 0*	lgprice *log 10 of Sale Price*	lgsize *Log 10 of Lot size*
1	15,700	-9	0	1.38	0	1	4.195900	0.1398790
2	15,900	-9	0	1.53	0	1	4.201400	0.1846910
3	10,000	-9	0	1.11	0	1	4.000000	0.0453230
4	15,400	-9	0	1.29	0	1	4.187520	0.1105900
5	23,501	-4	0	1.53	0	1	4.371090	0.1846910
6	40,004	-1	0	1.62	150	1	4.602100	0.2095150
7	18,600	-9	1	1.83	0	1	4.269510	0.2624510
8	21,950	-9	1	1.88	0	1	4.341430	0.2741580
9	26,280	-9	1	1.97	0	1	4.419630	0.2944660
10	16,750	-9	1	1.8	0	1	4.224010	0.2552730
11	32,890	-4	1	2.11	240	1	4.517060	0.3242820
12	36,500	-4	1	1.87	280	1	4.562290	0.2718420
13	27,202	-3	1	2.16	0	1	4.434600	0.3344540
14	36,606	-1	1	2.36	0	1	4.563550	0.3729120
15	34,606	-1	1	1.98	0	1	4.539150	0.2966650
16	64,133	-3	1	1.23	350	1	4.807080	0.0899050
17	23,500	-9	1	1.64	0	1	4.371070	0.2148440
18	23,503	-9	1	3.28	0	1	4.371120	0.5158740
19	75,000	-4	1	1.83	210	1	4.875060	0.2624510
20	27,778	-4	1	1.65	0	1	4.443700	0.2174840
21	14,900	-9	0	1.43	0	0	4.173190	0.1553360
22	15,800	-9	0	1.52	0	0	4.198660	0.1818440
23	20,000	-9	0	1.9	0	0	4.301030	0.2787540
24	12,400	-9	0	1.61	0	0	4.093420	0.2068260
25	13,100	-9	0	1.2	0	0	4.117270	0.0791810
26	12,000	-4	0	1.58	0	0	4.079180	0.1986570
27	12,000	-2	0	2	0	0	4.079180	0.3010300
28	21,900	-2	1	2.09	0	0	4.340440	0.3201460
29	22,600	-2	1	2.15	0	0	4.354110	0.3324380
30	35,100	-2	1	3.52	0	0	4.545310	0.5465430
31	27,300	-2	1	2.6	0	0	4.436160	0.4149730
32	27,300	-2	1	2.6	0	0	4.436160	0.4149730
33	27,300	-2	1	2.6	0	0	4.436160	0.4149730
34	42,800	-2	1	2.56	0	1	4.631440	0.4082400
35	37,200	-2	1	2.54	0	1	4.570540	0.4048340
36	49,010	-2	1	2.53	0	1	4.690280	0.4031210
37	55,105	-2	1	2.7	150	1	4.741190	0.4313640
38	60,000	-2	1	2.46	250	1	4.778150	0.3909350
39	69,010	-2	1	2.43	250	1	4.838910	0.3856060
40	56,000	-2	1	3.13	300	1	4.748190	0.4955440
41	90,000	-2	1	3.28	300	1	4.954240	0.5158740
42	90,000	-2	1	3.41	300	1	4.954240	0.5327540
43	27,500	-2	1	2.18	0	1	4.439330	0.3384560
44	40,000	-2	1	2.71	0	1	4.602060	0.4329690
45	40,000	-2	1	2.82	0	1	4.602060	0.4502490
46	91,400	-3	1	1.88	200	1	4.960950	0.2741580

Table 2. Example computations for value of base lot and quantification of adjustments

base lot	=			current sale			water front			2.12-acre lot			sold by auction	
lgprice (base lot)	=	4.19	+	0.0214	*time	+	0.278	water	+	0.63	lgsize	+	0.143	sale
	=	4.19	+	0.0214	*0	+	0.278	*1	+	0.63	lg2.12	+	0.143	*1
	=	4.816592												
price (base lot)	=	65,553												
base lot except				sold 9 years ago										
lgprice (9 years ago)	=	4.19	+	0.0214	*-9	+	0.278	*1	+	0.63	lg2.12	+	0.143	*1
	=	4.62399159												
price (9 years ago)	=	42,072		Adjustment per year for time over 9 years					=	5.05	% per year, compounded			
base lot except							has no water front							
lgprice no water front	=	4.19	+	0.0214	*0	+	0.278	*0	+	0.63	lg2.12	+	0.143	*1
	=	4.53859159												
price no water front	=	34,561		Adjustment for lack of water front					=	-47	%			
base lot except										1.12-acre lot				
lgprice 1.12-acre lot	=	4.19	+	0.00214	*0	+	0.278	*1	+	0.63	lg1.12	+	0.143	*1
	=	4.64200735												
price 1.12-acre lot	=	43,854		Adjustment for 1-acre difference in lot size					=	-33	%			
base lot except													direct sale	
lgprice direct sale	=	4.19	+	0.0214	*0	+	0.0278	*1	+	0.63	lg2.12	+	0.143	*0
	=	4.67359159												
price direct sale	=	47,162		Adjustment for direct sale vs. auction					=	-28	%			