Springbank Drive | Final Case Analysis

Background and Motivation

The decision to widen Springbank Drive from two lanes to four lanes by the Federal government and the City of London necessitates a careful evaluation of compensation for homeowners affected by this expansion. Traditional compensation approaches, such as real estate appraisers and formula-based methods, lack the precision and objectivity required for such a significant decision. To address this, Canning Consulting recommends employing a statistical technique, specifically Multiple Regression (MR), using data from 104 residential properties on and around Springbank Drive from January 1998 to May 2003.

Compensating homeowners appropriately is crucial not only for the affected individuals but also for maintaining the reputation of the Federal government in handling such situations. By utilizing MR, the City of London can provide a scientifically supported and fact-based assessment of compensation, minimizing vulnerability to unfounded claims.

The details of the technique used along with overall results have been summarized in the next section of this report.

Descriptive Statistics for Variables in Springbank Drive Models 1 & 2

Housing Characteristic	Mean	St. Dev.	Min	Max
Sales Price	134469.23	27743.65	69900.00	249900.00
Area of Frontage	902.85	255.55	0.00	1674.00
Basement Finished Area	396.78	287.16	0.00	1134.00
Age of House	49.52	15.70	0.00	118.00
House by 4-Lane Road	0.33	0.47	0.00	1.00
Traffic Counts	20221.15	8368.87	0.00	36000.00
One and Half Storey House	0.09	0.28	0.00	1.00
Two Storey House	0.15	0.36	0.00	1.00
Average Interior Condition	0.45	0.50	0.00	1.00
Good Interior Condition	0.34	0.47	0.00	1.00
Excellent Interior Condition	0.12	0.32	0.00	1.00
Average View	0.58	0.50	0.00	1.00
Good View	0.22	0.42	0.00	1.00
Presence of Pool	0.13	0.34	0.00	1.00

Note: Sample size for all above variables = 104

The data for this analysis includes 104 residential property sales around Springbank Drive from January 1998 to May 2003. The collected information includes key factors influencing house prices. The study focuses on all residents in the Springbank Drive vicinity. Notably, about 24% of homes in the area are greater than one storey. Additionally, the maximum traffic count is approximately 36,000, with an average of 20,000 around these houses. Predictions suggest a potential increase to 33,000 daily traffic counts, a crucial consideration overlooked in the City of London's historical models for house pricing.

Methodology and Model

Our study utilizes two distinct regression models, developed using data from properties near Spring Bank Drive, to predict house sale prices. These models, referred to as Model 1 and Model 2, are crafted to provide a nuanced understanding of the factors influencing property values.

Traditional home valuation often relies on comparing a few similar properties, a method which can overlook the broader spectrum of factors influencing a property's value. Our models, by contrast, use multiple regression analysis to consider a wide array of variables simultaneously. This approach not only captures the direct impact of each variable but also their interplay, offering a more accurate and holistic view of the housing market.

In Model 1, we incorporate 'House by 4-Lane Road', a variable chosen to gauge the impact of proximity to major roads on property value. Model 2 adds 'Traffic Count' to assess the effect of traffic volume. These variables were selected based on theoretical reasoning that links accessibility and noise pollution to property appeal and value.

Other variables included, such as frontage area, basement space, interior conditions, and property age, are grounded in theoretical foundations that reflect market dynamics and buyer preferences. For instance, the variable for the age of a property, despite its counterintuitive coefficient, is included to potentially capture niche market trends or historical value preferences.

We also consider variables like view quality and the presence of a pool, to evaluate their perceived value enhancement. The inclusion of house types, such as one-and-a-half and two-storey houses, reflects market preference trends.

We chose to exclude variables such as Exterior Amenities, since these variables could be endogenous if the decision to add amenities is influenced by factors like property value, neighborhood standards, or local regulations.

We present our models narratively, focusing on the story each variable tells in the context of the housing market. This approach not only makes the complex interactions more digestible but also allows for a broader audience to engage with and understand the intricacies of our models.

Results

Regression Results for the Springbank Drive Models 1 & 2

Housing Characteristic	*Model 1 Estimate (SE)*	*Model 2 Estimate (SE)*
Intercept	65552.19**	80038.69***
House by 4-Lane Road	-5088.84 (6273.63)	-
Traffic Counts	-	-0.73 (0.33) *
Area of Frontage	37.87 (10.68) ***	36.15 (10.33) ***
Basement Finished Area	16.97 (10.33)	18.83 (9.72) .
Age of House	76.99 (197.51)	112.72 (190.10)
One and a Half Storey House	1605.69 (10752.69)	731.29 (10509.38)
Two Storey House	6265.54 (8035.30)	8365.19 (7796.86)
Average Interior Condition	10079.03 (8784.87)	10077.80 (8521.31)
Good Interior Condition	18481.20 (9283.56) *	18425.24 (9073.71) *
Excellent Interior Condition	23543.33 (11510.44) *	23717.99 (11244.16) *
Average View	11001.05 (6463.46) .	9056.62 (6329.46)
Good View	17263.15 (8113.22) *	12500.59 (8130.60)
Presence of Pool	8038.85 (7218.62)	5556.94 (7063.80)
R^2	*0.3686*	*0.3967*
Sample Size	*104*	*104*

Note: *** p<0.001; ** p<0.01; * p<0.05; . p<0.1

Analysis

Location and Traffic:

- *House by 4-Lane Road (Model 1)*: The coefficient for "House by 4-Lane Road" is -5088.84, and it is not statistically significant at the 5% level. This implies that when holding the Area of Frontage, Basement Finished Area, Age of House, One and a Half Storey House, Two Storey House, Average Interior Condition, Good Interior Condition, Excellent Interior Condition, Average View, Good View, and Presence of Pool constant, houses by a 4-lane road are, on average, valued at $5088.84 less than those not located by a 4-lane road.

- *Traffic Count (Model 2)*: "Traffic Counts" has a coefficient of -0.73, which is significant at the 5% level. This indicates that an increase in traffic counts is associated with a decrease in the house value by an average of $0.73 per unit of traffic count, holding other variables constant. This confirms that higher traffic may act as a deterrent for potential buyers, leading to a reduction in property value.

Property Size and Condition:

- *Area of Frontage*: Both models show a positive and highly significant ($p<0.1\%$) relationship with sale price (Model 1: 37.87, Model 2: 36.15), indicating when holding all other factors constant, for each additional unit of frontage area, the value of the house increases by an average of $37.87.
- *Basement Finished Area*: This also has a positive effect in both models (Model 1: 16.97, Model 2: 18.83), although the results are not statistically significant. However, as expected, the results indicate a larger basement area is more appealing and increases the property values.
- *Good/Excellent Interior Condition*: These variables have positive coefficients in both models, with statistical significance at 5% level, implying that better interior conditions elicit higher prices.

House Type:

- *One and a Half Storey House*: Displays a positive relationship with sale price in both models but is not statistically significant.
- *Two Storey House*: Both models assign a substantial positive value to two-storey houses (Model 1: 6265.54, Model 2: 8365.19), indicating a strong market preference for two-Storey homes. However, these coefficients are not statistically significant.

Aesthetics and Amenities:

- *Average/Good View*: Positive coefficients in both models suggest that houses with better views are priced higher. The coefficient for "Good View" is statistically significant at 5% level in Model 1, but not in Model 2.
- *Presence of Pool*: In both models, having a pool is associated with a higher sale price, which is intuitive as pools are often considered a luxury feature. However, this correlation is not statistically significant in both models.

Age of House:

- In both models, the coefficient is positive (Model 1: 76.99, Model 2: 112.72), which is counterintuitive since one might expect older houses to be less valuable. However, this might reflect a premium for historical or well-maintained properties in certain markets. The correlation between the age and house value is not statistically significant in both models.

R^2 Values:

- The R^2 of 0.3686 for Model 1 and 0.3967 for Model 2 indicates that the variables in Model 1 explain approximately 36.86% of the variation in the dependent variable, while Model 2 explains slightly more at 39.67%. A higher R^2 in Model 2 suggests that including traffic counts, offer a better fit of the model to the data.

Findings

The coefficient signs generally align with expectations: larger frontage areas, spacious living areas, better interior conditions, and appealing views increase property values, while increased traffic and proximity to a four-lane road decrease them. The presence of a pool and the age of a house provide more nuanced insights, with a pool seen as a luxury feature, and older homes valued for character. Statistical significance in the model highlights robust relationships for informed decisions. For instance, the significantly positive impact of frontage area indicates a true market preference, while the non-significant effect of proximity to a four-lane road suggests a potential influence due to chance. These simplified models reveal a complex housing market where factors like traffic may not only directly impact values but also reflect preferences for areas with less traffic, potentially favoring higher-value home construction. The R^2 values capture a substantial part of sale price variation, emphasizing the housing market's complexity and the presence of unmodeled factors shaping prices. This paints a nuanced picture of a market valuing space, condition, and tranquility, influenced by various qualities.

Implications

Compensation = 12000+Lost Frontage+ Loss Value

Example

Property 1 = 12,000 + (Lost Frontage Area * $37.87) + (Difference in Traffic Count * $0.73)

Recommended Compensation for five properties due to increased traffic

Property	LUMP SUM	DIFFERENCE IN TRAFCOUNT	LOST FRONTAGE	LOSS VALUE = $0.73 *Diff in Traf count	LOST FRONTAGE VALUE = (Lost Frontage * $36.15)	COMPENSATION
1	$12,000	12000	15	$8,760	$ 542.25	**$21.302.25**
2	$12,000	9000	16	$6,570	$578.40	**$19,148.40**
3	$12,000	7000	13	$5,110	$469.95	**$17,579.95**
4	$12,000	9000	18	$6,570	$650.70	**$19,220.70**
5	$12,000	0	17	0	$614.55	**$12,614.55**

Alternative Compensation =12000+LF+LR

Example:

Property 1 = 12,000 + (Lost Frontage Area * $37.87) + 5,088.84

Recommended Compensation for five properties replacing a two-lane road with a four-lane road

Property	LUMP SUM	LANES BEFORE EXPANSION	LOST FRONTAGE	LOSS VALUE =$5,088.84	LOST FRONTAGE VALUE = (Lost Frontage * $37.87)	COMPENSATION
1	$12,000	Two lanes	15	$5,088.84	$ 568.05	**$17,656.89**
2	$12,000	Two lanes	16	$5,088.84	$605.92	**$17,94.76**
3	$12,000	Four lanes	13	0	$492.31	**$12,492.31**
4	$12,000	Two lanes	18	$5,088.84	$681.66	**$17,770.50**
5	$12,000	Two lanes	17	$5,088.84	$643.79	**$17,732.63**

Limitation of our analysis.

The absence of statistical significance for certain coefficients, including "One and a Half Storey House," "Two Storey House," and "Presence of Pool," is a notable limitation. While positive relationships between these variables and sale prices are observed, their lack of statistical significance implies potential unreliability as indicators of true market preferences. This limitation necessitates exploration of alternative model specifications and consideration of additional variables to better capture underlying dynamics affecting property values. Furthermore, the analysis overlooks potential synergistic or mitigating effects between variables due to the absence of interaction terms, potentially oversimplifying the complex interplay of housing characteristics. Incorporating such terms would provide a more accurate representation of the intricate relationships influencing property prices.

In conclusion, the examination of the Springbank Drive project underscores the importance of carefully reviewing compensation strategies. The introduction of statistical models, particularly Model 1 and Model 2, enhances our understanding of the diverse factors impacting housing prices. Insights gained, especially concerning the effects of traffic and road expansion, contribute to the development of a more informed and equitable compensation framework. However, recognizing the limitations of our models emphasizes the need for ongoing refinement and consideration of additional variables. This project establishes a robust foundation for implementing evidence-based compensation policies, promoting transparency and fairness for affected homeowners within the complexities of the housing market.

References:

Hiedeman, B. Quantitative Statistical Applications.