**Springbank Drive**

**Final Case Analysis**

**Background and Motivation**

In accordance with the Canada-Ontario Infrastructure Programme announced in August 2002, the City of London plans to widen Springbank Drive from two to four lanes between Wharncliffe Road and Wonderland Road, and to construct turning lanes at key intersections. The land expropriation is expected to impact properties by front yard setbacks and increased traffic volumes. Affected property owners in Springbank Drive received compensation offered by the city. Canning Consultants Inc., as the appointed real estate appraiser, is going to assess models for fair compensation.

**Descriptive Statistics**

**Source of data:** Canning Consultants Inc.

**Sample Size:** 104 properties in and around Springbank Drive sold from January 1998 to May 2003

The population sampled here are the residential properties of Springbank Drive, which were affected by the city's road expansion project. We assembled the sales data of 104 residential properties on and around Springbank Drive from January 1998 to May 2003. Information about these properties, like lot size, were gathered to estimate the loss of market value caused by the road widening and to propose an accurate and justifiable compensation on the homeowners' losses.

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| **Variable** | **Mean** | **Standard Deviation** |
| **Age** | 49.52 | 15.70 |
| **Frontage Area** | 902.85 | 255.55 |
| **Excellent or Good Interior Condition** | 0.45 | 0.50 |
| **Good Street View** | 0.22 | 0.42 |
| **Pool** | 0.13 | 0.34 |
| **Four-lane road** | 0.33 | 0.47 |
| **Traffic Count** | 20,221.15 | 8,368.87 |
| **Sales Price** | 134,469.23 | 27,743.65 |

**Units of Measurement**

**Age:** years

**Frontage Area:** square feet (sqft)

**Excellent or Good Interior Condition:** dummy variable; 1 if the property has a good or excellent interior condition; 0 if the property has fair or average interior condition

**Good Street View:** dummy variable; 1 if the property has a good street view; 0 if the property has fair or average street view

**Pool:** dummy variable; 1 if the property has a pool; 0 otherwise

**Four-lane road:** dummy variable; 1 if the property is located in a four-lane road; 0 if the property is located in typical residential street i.e. two-lane road

**Traffic Count:** number of vehicles per day

**Sales Price:** Canadian Dollars

Springbank Drive is a historical neighborhood, with on an average 50-year-old houses. Frontage areas vary, offering a blend of cozy spaces and roomy yards, with an average of 903 sqft. For interiors, nearly half of these homes have excellent or good conditions. Only 22% of the properties have a good view of the street from their home. Similarly, having a pool is a less common feature, in only 13% of the properties. 67% of the properties were in a typical residential street, indicating a majority of the sample would lose a part of their frontage area at the road expansion project. The average daily traffic count of approximately 20,000 vehicles is approximately 13,000 vehicles less than the expected traffic after the road expansion (33,000 vehicles per day).

**Methodology and Model**

Quantitative methods are favored to discern the relationship between the property attributes and value. Multiple regression models analyze the relative influences of the independent variables (property attributes in our context) on the dependent variables (property value). Compared to traditional sales comparison methods, the quantitative approach is flexible to incorporate relevant and appropriate variables for a more comprehensive analysis. Another advantage is the valuation method’s objectivity and data-driven nature. It builds a robust foundation to assess the impact of each variable on the property value.

Our holistic variable selection considers the intuitive property characteristics and other relevant features. To address the anticipated impact of the project, current frontage area and measures of traffic (four-lane road and traffic count) are included in the models.

Four additional variables – house age, interior condition, street view, and the presence of pool – are selected as controlled variables. These variables ensure the observed changes in dependent variable (property value) are resulted from the manipulated independent variable (measures of traffic) but not variations in other factors.

House age is included for its impact on potential maintenance cost while pool is a special feature that influences the desirability and property value. To simply the model and determine the positive influences on property value, interior condition and street view, which are originally measured in ordinal scale, are grouped as “excellent or good” and “average and fair” interior condition, and “good” and “average and fair” street view respectively.

Therefore, we developed two models for the estimation of property value:

**Model 1:**

**Model 2:**

**Regression Results**

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| **Dependent variable**: property value (in Canadian dollar) | | |
|  | **Model 1** | **Model 2** |
| **Intercept** | 103,512.06\*\*\*  (12,053.62) | 116,467.49\*\*\*  (13,535.38) |
| **Frontage area** | 36.50\*\*\*  (9.44) | 35.70\*\*\*  (9.25) |
| **Four-lane road** | -8,744.89  (5,718.32) |  |
| **Traffic count** |  | -0.79\*  (0.32) |
| **House age** | -141.41  (152.79) | -108.42  (150.82) |
| **Excellent or good**  **interior condition** | 11,321.57\*  (5,093.80) | 11,707.59\*  (4,852.65) |
| **Good street view** | 7,100.04  (5,918.47) | 4,043.17  (6,018.93) |
| **Pool** | 8,753.96  (7,196.48) | 6,932.54  (7,054.06) |
| **R-squared** | 0.31 | 0.34 |
| **Adjust R-squared** | 0.27 | 0.29 |
| Number of observations is 104. | | |
| Standard errors are in parentheses. | | |
| \*\*\* significant at 0.1%, \*\* significant at 1%, \* significant at 5% | | |

As expected, the magnitude of frontage area is positive and highly statistically significant to the property value. Controlling for the measure of traffic, house age, interior condition, street view and the presence of pool, each additional square footage of the property is associated to the predicted increase in property value at $36.50 (in model 1) and $35.70 (in model 2) on average, at 0.1% significance level.

Moreover, properties with excellent or good interior condition are highly substantively significant, with an expected premium at $11,322 in model 1 and $11,708 in model 2, on average, than properties with average or fair interior condition, at 5% significance level level, controlling frontage area, measure of traffic, house air, street view and the presence of pool.

Other features that contribute premium to the property value include good street view and presence of pool. Controlling frontage area, measure of traffic, house age, interior condition, and the presence of pool, on average, the premium associated with a good view relative to an average or fair view is $7,100 (in model 1) and $4,043 (in model 2). Similarly, controlling frontage area, measure of traffic, house age, interior condition, and street view, properties with a pool is expected to value $8,754 (in model 1) and $6,933 (in model 2) more than properties without a pool.

On the other hand, the negative magnitude on the measure of traffic (four-lane road and traffic count) and house age are consistent with expectations. Intuitively speaking, heavy traffic outside a residential property is less desirable and the regression results support the idea. Controlling frontage area, house age, interior condition, street view, and the presence of pool, on average, properties on a four-lane road are expected to value $8,745 less than those on a typical residential two-lane road; and each additional 1,000 traffic count per day is associated to the predicted decrease in property value at $790 at a 5% significance level.

House age is often associated with potential maintenance cost and thus shares a negative magnitude on property value. On average, a property that ages one year more is associated with an expected $141 (in model 1) and $108 (in model 2) less in property value, controlling frontage area, measure of traffic, interior condition, street view, and the presence of pool.

The R-squared value of 31% in model 1 and 34% in model 2 suggests the goodness of fit of the regression models, indicating how well the models fit the observed data. Model 2 provide a slightly better fit than model 1 in our context.

**Implications**

**Recommended Compensation based on Model 1**

Recommended compensation model 1 = 12,000 + (Lost frontage area \* 36.50) + 8,744.89

Note:

The highlighted sum in the above equation is applicable only for those properties that were in a 2-lane road before the expansion)

**Recommended compensation for five homes**

Expropriated Area: $36.5 per square foot

Increased Lanes: $8,744.89

Other losses: $12,000 lump sum

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| **Property #** | **Lost Frontage** | **Number of Lanes (before expansion)** | **Recommended Compensation** |
| 1 | 15 | 2-Lane | $21,292.39 |
| 2 | 16 | 2-Lane | $21,328.89 |
| 3 | 13 | 4-Lane | $12,474.50 |
| 4 | 18 | 2-Lane | $21,401.89 |
| 5 | 17 | 2-Lane | $21,365.39 |

**Recommended Compensation based on Model 2**

Recommended compensation model 2 = 12,000 + (Lost frontage area \* 35.70) + ((33,000 – Traffic count per day before expansion) \* 0.79)

Note:

1. Traffic count is expected to reach 33,000 vehicles per day for all properties after the road expansion
2. The highlighted sum in the above equation is applicable only for those properties that had traffic count less than 33,000 vehicles per day before the road expansion

**Recommended compensation for five homes**

Expropriated Area: $35.70 per square foot

Increased Traffic: $0.79 per increased vehicle

Other losses: $12,000 lump sum

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| **Property #** | **Lost Frontage** | **Traffic Count (before expansion)** | **Recommended Compensation** |
| 1 | 15 | 21,000 | $22,015.50 |
| 2 | 16 | 24,000 | $19,681.20 |
| 3 | 13 | 26,000 | $17,994.10 |
| 4 | 18 | 24,000 | $19,752.60 |
| 5 | 17 | 33,000 | $12,606.90 |

**Limitations**

The discussed models are subject to a few caveats. Firstly, the small sample size (104 observations) restricts the inclusion of only 8 independent variables, to comply with Central Limit Theorem, impacting model explanatory power. A small sample size also contributes to higher standard errors, smaller t-values and thus higher p-values, making it challenging to reject null hypothesis and increasing the risk of type II error.

Secondly, our models are built based on the available data, and thus exists the possibility of omitted variable bias, implying that not all variables influencing property values are included in estimation. Thirdly, there are concerns on the data accuracy. Examples include only one property having two car garage spaces, and another property reporting zero daily traffic count. Such discrepancies may hinder the exploratory power of the models.