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Band votes to shut up Sparrow, Vancouver Courier, 3 October 1999, p. 10.

City getting no respect in negotiation process, Vancouver Courier, 7 October 1999.

Leaseholders tell Musqueam no deal; band says evictions next, Vancouver Courier, 21 October 1999, p. 12.

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73 Musqueam residents get eviction notice, Vancouver Sun, 21 September 1999, p A1.

would be useful in planning lease agreements and helping to inform purchasers about the ramifications of leasing property. Disaggregating discount preferences based on demographics, such as age, would also be an interesting avenue for future research.

The following year, 1993, exhibits much stronger evidence of a structural break at conventional levels of significance. This supports the notion that Musqueam Park experiences a change in the discounting behaviour of purchasers. The structural test suggests that purchaser event horizons are around 2-3 years instead of the 4 years previously speculated.

The conclusion that differences exist between Musqueam and Salish Park discounting behaviour during 1980-98 is supported statistically. Stability tests show a difference at the 10 percent level of significance. This is a somewhat weak result, but is understandable considering that a fairly significant difference exists between discounting in the 1980s and 1990s. Where data allow, annual tests are conducted for differences between Musqueam and Salish Park discounts. Two years (1991 and 1998) have enough Musqueam Park sales to allow testing. Results for 1991 show no particularly significant evidence of a structural break, however 1998 exhibits strong evidence of a break. In other words, Musqueam and Salish Park properties were being discounted at relatively the same rate in 1991 and significantly different rates in 1998. This is consistent with a change in discounting behaviour around 1992/93, but the evidence is not unshakeable.

Tests for non-linearity indicate that non-linearity is not a significant factor, for the most part, in property valuation in the Southlands region. This result is important in that it establishes the validity of the specific non-arbitrage prices imputed for Musqueam and Salish Park. By the same token, Musqueam and Salish Park discounts are also valid calculations. The results of structural stability tests show that while there is some grey area concerning the timing of changes in discounting behaviour, conclusions reached in section 4.1 are valid.

5 CONCLUSIONS

Non-arbitrage theory provides and interesting and effective method for determining the magnitude of discounts in Musqueam and Salish Park during 1980-1998. Examination of these discounts shows that Musqueam and Salish Park exhibit similar rates of discount during the 1980s, but differential rates in the 1990s. Lower discount rates in Salish Park, especially during 1991-98, indicate that purchasers are willing to pay more for the relative certainty of pre-paid leases.

Musqueam Park sales during this period show a significant change in purchaser discounting behaviour occurring around 1992-93. Discounts on Musqueam Park properties increased significantly from 33 percent in 1991 to 57 percent of the non-arbitrage price in 1994. This result is consistent with purchaser anticipation of lease renegotiations occurring in 1995. Although data are limited after 1995, the average discount of 57 percent in 1998 suggests that discounts in Musqueam Park persist.

These results hold important implications for the future negotiation of leases on First Nations lands throughout Canada. Foremost is the result that pre-paid leases exhibit greater stability. Lessons from this paper may be used in designing lease renegotiations to minimize uncertainty regarding the financial obligations associated with continuing payment leases. Conversion to pre-paid leases may be one such avenue. Future research disaggregating the effects of different factors affecting purchaser discounting behaviour

longer willing to pay amounts that were acceptable to the vendor. In other words, uncertainty may have pushed discounts in Musqueam Park beyond a point that was acceptable to potential vendors, preventing sales during 1995-97. Neither this possibility nor distance to the event horizon, though, may be analyzed without further qualitative data from residents during 1991-1997.

Salish Park sales exhibit a slight decrease in discounts for 1996-97 which is of interest. Although it is rather speculative, it is possible that discounts in Salish Park are responding to the crisis in Musqueam Park by decreasing. Data for 1989-95 show that Salish Park pre-paid leases exhibit much greater price stability than Musqueam Park (for most of the period). Musqueam Park lease renegotiation has no direct effect on Salish Park, implying that uncertainty regarding the PDV of leasing in Salish Park is mostly unaffected. It may be that potential interest is shifted to Salish Park during the immediate years of upheaval in Musqueam Park, resulting in a decrease in Salish Park discounts. In effect, this is a reactionary recognition of the stability of pre-paid leases. Again, this conjecture must be qualified by recognizing the data limitations.

The results seen so far establish that substantial discounts exist for both Musqueam and Salish Park properties. Differences in average annual discounts exist for Musqueam and Salish Park, especially following 1991. Concerns about deficiencies in the data demand that the robustness of these results be tested. Results of these tests are presented below.

4.2 Testing Robustness of the Results

Establishing the validity of the discounts calculated for Musqueam and Salish Park is a pivotal requirement of this paper. Tests for non-linearity are carried out to validate the coefficients used in imputing non-arbitrage prices for Musqueam and Salish Park. Results from section 4.1 indicate that discounting behaviour for Musqueam Park properties changed in the early 1990s. Discounts after 1991 showed a significant increase in all years for which data are available. This would indicate that a structural change has taken place. There also appears to be substantial difference between Musqueam and Salish Park discounts during the 1990s. The validity of these results is aided by providing statistical evidence that significant structural differences exist between discounts in Musqueam and Salish Park and for Musqueam Park discounting in the 1980s versus the 1990s.

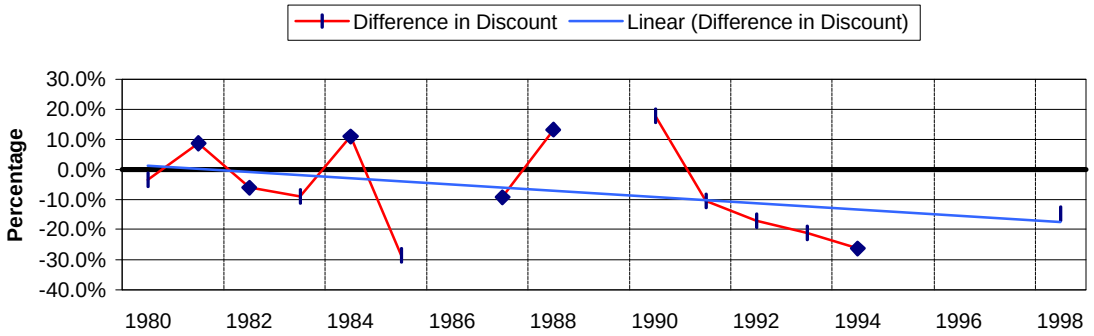
Non-linearity in the effects of factors affecting discounting behaviour is tested in several ways. First, regressions of real sale prices in Southlands on squared property size and a squared proxy for fixed improvement quality are conducted. A term which interacts property size and the fixed improvement proxy is also used as a regressor. Preliminary results indicate that linear rather than non-linear regressors provide a better overall fit. F-tests conducted to determine if the explanatory power of a combined linear regressor with a non-linear adjustment is greater than that of a simple linear regressor confirm that the linear model is a good choice. This establishes the validity of the coefficients used in calculating Musqueam and Salish Park discounts.

Chow tests for structural stability in Musqueam Park discounts during 1980-98 indicate that a structural change begins to occur around in 1992 (significant at 10 percent level).

the 1998 discount level suggests that the trend is maintained during these years. During the same period Salish Park discounts remain quite stable, averaging approximately 30 percent. There is an interesting decrease in Salish Park discounts in 1996-97 that is discussed below.

It is interesting to note that Musqueam and Salish Park discounts begin to diverge beginning in 1991 at the time of the transfer of taxation powers to the Musqueam Band. Comparing subsequent discount trends in both Musqueam and Salish Park, only Musqueam Park exhibits increasing discounts. Figure 2 shows the annual difference in discounts between Musqueam and Salish Park.

Figure 2: ***Difference in Discounts Between Musqueam Park and Salish Park, 1980-98***



Differences in Musqueam and Salish Park discounts fluctuate around zero during the 1980s, although some large swings appear due to limited sales data in particular years. Subsequent to 1991, however, there is a marked downward trend indicating that Musqueam Park properties are being increasingly discounted with time.

Since taxation affects Musqueam and Salish Park equally[21], for the most part, the continued stability of Salish Park discounts implies that Musqueam Park discounts increase for a different reason. Anticipation of the 1995 lease renegotiations is the most likely culprit, especially as contact between residents reinforces apprehension about potential outcomes of the renegotiations. Apprehension of the 1995 outcome would make forward-looking buyers less willing to pay the non-arbitrage price for a Musqueam Park property. The question is how far ahead will they anticipate the uncertainty of the negotiation outcome? The data suggest that anticipation had begun by the 1991 taxation transfer, however the data are too limited to act as evidence of anticipation prior to 1991. This course of reasoning implies that purchasers of Musqueam Park leasing rights had an event-horizon of at least four years in 1991.

The point of lease renegotiation, 1995, is the main area of interest, however data limit the conclusions that may be drawn. Anticipation of the uncertainty surrounding lease renegotiation would definitely increase the discount on Musqueam Park properties. However, the lack of sales in Musqueam Park for 1995-97 prevents immediate direct examination of the behaviour of discounts. Far from disheartening, the lack of evidence may actually imply that discounts were so extreme that would-be purchasers were no

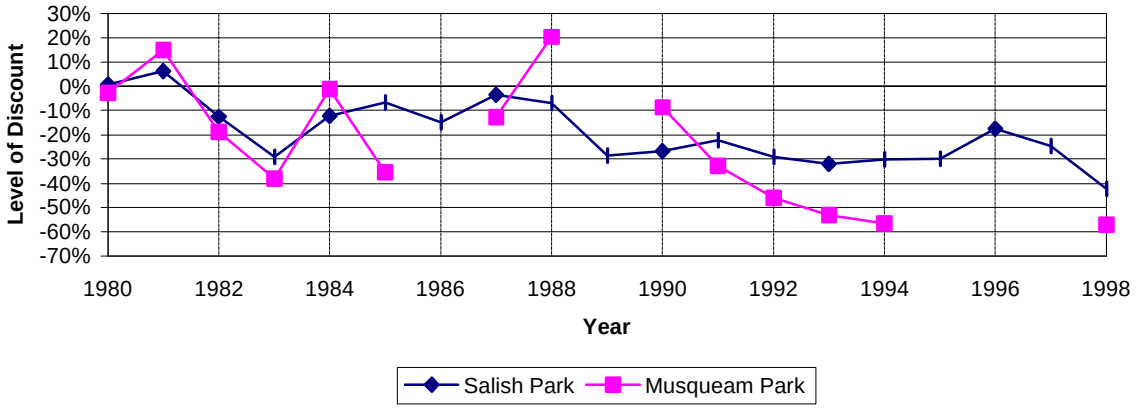
[21] Assessed values of Musqueam Park properties are slightly higher, on average, than Salish Park.

renegotiation in Musqueam Park promised to be pivotal. The transfer of taxation powers in 1991 may have a substantial effect on observed discounts during subsequent years. Lease renegotiations, due to the associated uncertainty, should be accompanied by increasing discounts. The overall pattern one would expect, given the prominence of discount factors at during discrete periods, is a noticeable increase in discounts for both Musqueam and Salish Park beginning in 1991 (with transfer of taxation) followed by a substantial increase in discounts for Musqueam Park in 1995 (with lease renegotiations in Musqueam Park) and subsequent years. Anticipation of the lease renegotiations will likely cause some level of increased discount in Musqueam Park for several years before lease renegotiations. These patterns will be considered during analysis of the discount calculation results.

4.1 Discount Levels in Musqueam and Salish Park

The pattern of discounts during 1980-98 follows expectations for the most part. Figure 1 depicts trends in Musqueam and Salish Park discounts during 1980-98.Musqueam and Salish Park exhibit a similar level of discount, fluctuating around 15 percent, until the late 1980s. As seen in figure 1, this relationship is especially close through 1984. Musqueam Park discounts tend to fluctuate more than those in Salish Park during the latter half of the decade, but this is mostly due to data deficiencies for Musqueam Park. Neither area faced pressing uncertainty during the 1980s regarding levels of financial obligation under their respective leasing regimes. In the medium-term (i.e. 5-10 years), both Musqueam and Salish Park offered relatively similar stability in the expected PDV of home and property. For all intensive purposes, Musqueam Park properties exhibit the same stability as pre-paid lease counterparts in Salish Park.

Figure 1: ***Discount on Non-Arbitrage Sale Prices***



By 1991, the relative stability enjoyed in Musqueam Park starts to break down as the level of discounts increases relative to Salish Park. As seen in figure 1, Musqueam Park properties begin to experience a substantial increase in discounts beginning in 1991. Discounts increase from approximately 30 percent in 1991 to a peak of 55 percent in 1998. Although discount calculations are unavailable for Musqueam Park in 1995-97,

beginning 1990-91. Data shortages prevent meaningful analysis of certain years during 1986-1989, but the overall picture remains the same.

As explained in section 2.3 above, all factors affecting discounting behaviour are endogenized using non-arbitrage methodology. Calculation of the non-arbitrage prices for properties in Musqueam and Salish Park assumes that buyers are risk-neutral with identical preferences (including personal time-discount preferences). Discounts calculated by taking the ratios of the actual sale prices to the imputed non-arbitrage prices show the effects of all factors outside the perfect information non-arbitrage world. Whereas buyers in a non-arbitrage world have identical (or perfectly known) preferences, buyers in the real world have far greater heterogeneity of preferences, especially with regard to risk, uncertainty, and intertemporal discount. The calculated discounts, therefore, show the difference between perfectly known preferences and the actual preferences of buyers in Musqueam and Salish Park.

Factors affecting discounting behaviour in Musqueam and Salish Park vary in their relative importance. Based on discussion with residents and reactions to potential changes in annual lease payments in Musqueam Park, uncertainty regarding the level of financial obligation associated with leasing stands out as the primary factor affecting discounts. Buyers are willing to pay less than the non-arbitrage price if the level of annual lease payments is uncertain. The discount demanded by buyers may also be increased if the distribution of possible outcomes varies. Buyers will demand less discount if a wide range of possible outcomes is more likely to result in an outcome in a certain range (i.e. less variance) than if all outcomes across the range are equally possible. For example, consider two hypothetical cases – first, possible annual lease payments range from 3 to 6 percent of the unimproved land value with equal possibility that payments will fall anywhere in that range. Second, given the same range of possible outcomes, there is a 70 percent chance that the actual outcome will be 4.5 percent. Buyers will be willing to pay more to lease under the latter case because they are better able to make an accurate prediction of the financial obligations of the lease.

Lease renegotiation introduced a substantial element of uncertainty into determination of the financial liabilities associated with Musqueam Park leases. This uncertainty had the added impact of an unknown distribution of possible outcomes, although a fairly certain range of possible outcomes (outlined in section 1.1) has emerged since 1995. Due to their pre-paid nature, Salish Park leases are not associated with the element of uncertainty caused by lease renegotiation. In 1991, the Musqueam Band took over taxation and governmental duties for Musqueam and Salish Park. Residents of Musqueam and Salish Park were represented through the Musqueam Taxation Advisory Committee (TAC), but events surrounding property assessments and political protest[20] have weakened this representation. Since leaseholders are required to remit property taxes to the Musqueam Band, weakened representation is likely a cause of increased discounting for Musqueam and Salish Park properties.

The history of events in Musqueam and Salish Park suggest that a certain pattern to discounting behaviour may be expected. No *major* events affecting the PDV of Musqueam or Salish Park properties occurred during the 1980s, but the 1995 lease

[20] Kesselman and Albert (1999), unpublished.

Coefficients from these regressions are then applied to data from Musqueam and Salish Park to impute the non-arbitrage price for Musqueam and Salish Park properties. Data on property size and quality of fixed improvements are multiplied by the coefficients obtained from the above method. Summing the products and the appropriate annual dummy coefficient provide the imputed non-arbitrage price. Formally, the coefficients presented in table 1 are used in the following manner to impute non-arbitrage sale prices for each individual Musqueam and Salish Park property:

Tests for non-linearity are conducted to account for possible specification bias in the above regressions. Property size and the fixed-improvement proxy are squared and used as regressors for property sale price in Musqueam and Salish Park. An interaction term for property size and fixed-improvements is also considered. Testing for non-linearity gives an indication of how well a linear approximation fits the data. A linear approximation is not the best fit if coefficients on the squared or interaction variables are statistically significant. If the regression coefficients are significant then the respective non-linear variables must be considered in calculating non-arbitrage prices in Musqueam and Salish Park. Non-linearity does not prove to be a significant factor in how properties are valued in Southlands during 1980-98 and non-linearity will not be considered any further in this presentation.

Discounts may be calculated once non-arbitrage prices for Musqueam and Salish Park properties have been imputed. Discounts are calculated by subtracting from unity the ratio of the actual sales prices in Musqueam and Salish Park and their respective non-arbitrage prices. Formally,

$$1 - \frac{P_{actual}}{P_{non-arbitrage}} \times 100\% = Discount$$

where,

P_{actual} is the actual sale price of a Musqueam or Salish Park property in a given year and $P_{non\text{-}arbitrage}$ is the associated non-arbitrage price for that property. Negative values indicate that the purchaser of that property paid a premium over the non-arbitrage price for a property. Cases of premia are discussed in section 4.

These calculations are conducted on disaggregated data for Musqueam and Salish Park. Data limitations (i.e. no sales in particular years) for Musqueam Park make it impossible to calculate discounts for 1986, 1989, and 1995 to 1997. The discounts that are calculated adequately serve the analysis of this study, however.

4 Results and Discussion

Discount calculations for Musqueam and Salish Park provide fairly descriptive results. There is distinct evidence that Musqueam and Salish Park experienced similar levels of discount during the 1980s, however significant and growing differences are seen

Data are available for properties comparable to those in Musqueam and Salish Park. All data is originally available in nominal amount and requires deflation before rigorous analysis. Consumer price index data are linked to provide an index covering 1980-98. Sales prices for Musqueam and Salish Park are deflated to constant 1992 $CDN.

Aside from the leasing conditions affecting Musqueam and Salish Park potential purchasers will consider the characteristics of Musqueam and Salish Park properties in the same manner as comparable properties. Annual linear regressions of comparable properties' sale prices on property size and a proxy for the overall quality of fixed-improvements are carried out in order to determine how purchasers evaluate property characteristics. Assessed value of fixed improvements is used as a proxy for overall quality of fixed improvements, included the primary building or house. Regressions with annual data are used to capture possible changes over time in how purchasers evaluate property characteristics. The general form of each annual regression is:

$$Sale = a + b_1 area + b_2 proxy$$

where *Sale* is the real sale price of a property in the comparison area, a is the year effect, *area* is the property size in squared feet, *proxy* is the proxy (explained above) for the quality of fixed-improvements on the property, and b_1 and b_2 represent the effect of unit increases of *area* and *proxy* on the real sale price of a property. Table 1 presents annual coefficients.

Table 1: ***Comparison Group Coefficients***

Year	Area	Proxy	Year-Effect
1980	4.8549	1.023	179920
1981	10.876	2.6993	-8088.2
1982	7.0487	1.7192	108050
1983	35.32	1.971	-106040
1984	9.4098	1.313	132520
1985	20.708	1.1803	30804
1986	10.471	1.0602	124020
1987	13.913	0.6909	150840
1988	10.305	0.65259	264280
1989	26.725	1.3762	224680
1990	26.339	1.9106	137060
1991	26.269	1.3278	178440
1992	25.763	1.751	247400
1993	38.631	0.71959	231360
1994	25.112	0.99695	345150
1995	25.681	0.5172	351840
1996	10.744	0.43841	448890
1997	30.192	0.93696	205960
1998	25.679	1.3547	226570

Notes: **Area** and **Proxy** coefficients represent the increase in real sale price (in dollars) per square foot and/or proxy value, respectively. The year effect coefficient shows the dollar effect on the real sale price for the year in which a sale occurs.

Sale prices in Musqueam and Salish Park are recorded from 1980-1990, with sales in the comparison area collected for 1980-1999. As previously noted, sales data for Musqueam and Salish Park during late 1990-1999 are provided by the Musqueam Nation. For each sale, property size and assessed value of improvements (including homes) are also recorded. It is the case that certain years have very few observations on sales for Musqueam and Salish Park. This occurs when property assessment and sales microfiche are missing (i.e. for 1982 and 1986). This problem is partially circumvented by using microfiche from later years[16] in which sales from 1982 and 1986 are sometimes noted. Sales are recorded only if a property was sold in 1982 or 1986 *and* the year of the series examined. The problem of small sample size is thereby exacerbated for these years since the conditional probability of sale is much smaller than the sale of independent properties.[17]

The comparison group is determined by the availability of data during each year. Sales data from the King Edward region in Dunbar and the Southlands region immediately east of Musqueam Indian Reserve #2 are combined to provide a representative sample of comparable freehold properties. This is the same pool of properties used by BC Assessment in calculating annual assessments for Musqueam Park and Salish Park. Since most properties are not sold repeatedly year after year, the properties composing the comparison group vary annually. The weighting of neighbourhoods favours the Southlands region due to its greater area, although the exact weighting also varies annually. Note that properties within the Agricultural Land Reserve (ALR) are not included in the pool of comparable properties.[18]

The CANSIM database does not publish a CPI series covering 1980-1998. Label D44957 covers the CPI from 1980-1991 and label D28606 covers 1992-1998, both using annual frequency of observations. Both series use 1992 as the base year, making linkage of the two series a simple matter.

3.3 Methodology of Calculations

Ideally, it would be useful to calculate the individual discount effects of each of the factors noted in section 2, however data that are suitably disaggregated are not available. It would be necessary to collect data on personal preferences from the homeowners associated with each sale in Musqueam and Salish Park during 1980-1998. This is an unlikely task for many reasons.[19] Consequently, the method used must calculate discounts using data with all factors endogenized. Non-arbitrage theory provides such a method when applied.

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[16] Sales series after 1985 list three or more previous sales for each sale during that series year, For example, if a property sells in 1990, it will be listed with the 1990 sale price and sale prices in years in which it was previously sold.

[17] Recording conditional sales also holds some benefit by decreasing the variability of properties used in the comparison group.

[18] Inclusion of ALR lands would diminish the degree of similarity between Southlands and Musqueam and Salish Park properties. ALR lands are often priced differently (lower) than non-ALR lands.

[19] Foremost among these reasons is the possibility that previous homeowners cannot be contacted due to passing away or changes of address. The return to such arduous data collection is unlikely to justify the effort.

3.1 Sources of Non-Survey Data

Several sources of data are used for analysis. Qualitative data is available in the previously described Vancouver City Archives. This includes council minutes, council reports, submissions to council, and internal memos circulated by City of Vancouver employees from various departments. A general search of the material prior to 1992 may be accomplished using the Internet.[14] A general search of material later than 1992, but with limited access to originals, may be accomplished through the City of Vancouver web search engine.[15] The utility of these two data sources is mainly in the realm of contextual evidence of events affecting Musqueam and Salish Park and the surrounding areas in Southlands.

Estimates of property and improvement values are available at the British Columbia Assessment Authority office in Vancouver. Sale price data are published for all regions of Vancouver with the exception of Musqueam and Salish Park after 1990. All data are available on microfiche for dates back to the creation of the British Columbia Assessment Authority (1971). Sale price data for Musqueam and Salish Park after 1990 are provided by the Office of the Musqueam First Nation.

Consumer price index (CPI) data are available from Statistics Canada through the CANSIM database.

3.2 Description of Data

Property value assessments resident in the British Columbia Assessment Authority archives are comprised of two parts: land value and improvement value. Land values are assessed on the basis of comparison with similar properties. In the particular case of Musqueam and Salish Park lots, comparison is made with freehold properties in the nearby Southlands and King Edward regions. Improvement value assessments are conducted for all fixed property improvements. The assessment is based on determining the cost of building comparable improvements from nothing (cost approach to valuation). It should be noted that the size of the comparison group and properties used vary from year to year depending on available sales data. The same note applies to Musqueam and Salish Park – data available for analysis is limited by the number of sales occurring during a given year.

The assessment series for the Musqueam and Salish Park subdivision is available from the inception of the British Columbia Assessment Authority in 1974 until the 2000 property value assessment. Data for Musqueam and Salish Park prior to 1974 is available at the Vancouver City Archives. For purposes of this project, assessment data are collected on all 75 households bi-annually for the years 1980-1989 and annually from 1991-1999. Data collected from the British Columbia Assessment Authority archives is available from this researcher on request.

[14] Vancouver City Archives, http://www.city.vancouver.bc.ca/archives/webpubhtml/qbes/ws_publc.htm
[15] City of Vancouver, http://www.city.vancouver.bc.ca

the liabilities is known. Estimates of the discount factors will imply levels of risk and uncertainty associated with each of the areas under examination. Unfortunately, it will not be possible to make statements with any certainty concerning buyer preferences that directly affect discount behaviour, however discount magnitudes calculated using non-arbitrage techniques endogenize any factors affecting the price of leasing rights to a property.

3 Data and Methodology

Data collection for this study proved exceedingly troublesome for several reasons. First, real-estate data are usually not available in any form where small regions or neighbourhoods are aggregated. In cases where collection by area is indicated, available statistics generally involve large tracts of land that are useless for more than casual statements. Econometric analysis of these stylized statistics holds little value.[12] Second, public data are not organized into computer databases that are searchable at no cost. Payment of substantial fees will allow access to computer databases[13], but the costs are prohibitive without research funding. When funding is not available, microfiche is the primary available medium of record and requires labour-intensive search techniques. Third, numerous administrative classification and labeling changes compound difficulties in searching the databases. Each new classification requires the researcher to effectively re-determine the target of their search. Finally, frequency of observations changed during the two decades under examination (1980-1999). The latter two data collection issues require repeated clarification with staff at the BC Assessment in order to maintain the consistency of data collected.

Real-estate data, by its very nature, imposes substantial limitations on available analyses. Foremost is the limitation of sample size imposed by the physical layout of real-estate development underlying the data. Examination of subgroups within an area amplifies concerns about sample size. Sales data provide an excellent example of this point since a neighbourhood will usually experience only a limited turnover during any particular year. It is virtually impossible to construct a significant sample of longitudinal observations on sales in a small region unless relatively high data frequency is not required. Second, the process of assessment is highly subjective. Although a standardized set of regulations is used in conducting assessments, each individual assessor is required to use their own interpretation in applying the regulations. It is infeasible, if not impossible, to determine the differences in assessment values accruing to variation in the application of assessment regulations.

Discount calculations involve a process of imputing non-arbitrage prices for Musqueam and Salish Park properties. The methodology of these calculations is explained in section 3.3 below.

[12] Data available from the Vancouver Real Estate Board is a case in point. The highest level of specificity (at the public level) was for all of Point Grey.

[13] The Multiple Listing Service (MLS) is a computer database of all property assessments and publicly recorded sales occurring from approximately 1990. Use of MLS requires an annual subscription fee.

goods for a time may also provide utility to an individual. Flows of services can take different forms: free banking, use of a public transportation system, or the use of a house and land for a specified period of time, to name a few examples. The latter example describes the principle behind property leasing – an individual buys the asset, leasing rights, to gain the flow of services, namely the right to live on the property and enjoy its use until expiry of the leasing rights. In the case of leasing, purchasing the rights to the lease may entitle the bearer of those rights to a continuing flow of services outright, but may also make the bearer liable for a certain level of payments (in the case of a continuing payment lease). In the case of a continuing payment lease, purchase of the leasing rights simply entitles an individual to a flow of services provided they fulfill the associated financial liabilities. For example, Musqueam Park leaseholders purchased the leasing rights to properties in Musqueam Park. Provided they pay the annual lease payment required by the Musqueam Band, they may continue to use the leased properties for the remainder of the lease.

Changes in the financial liabilities attached to an asset will affect the pricing of the leasing rights. Unpredictable increases in financial liabilities associated with an asset providing a given flow of services will also lead to discounting of the asset's PDV. If increases are potentially great in magnitude, stronger discounts of the price of the asset will occur. If the PDV of a flow of services does not change, even though the price of that flow has increased, the price the lessee is willing to pay to purchase the rights to that flow of services will decrease to maintain the former level of liabilities. A decrease in the price of the leasing rights compensates buyers for the increased liabilities demanded for the flow of services. The example most pertinent to this study is of leasing property in Musqueam Park. The promise of potentially huge increases in the lease payments required to gain use of homes and property in Musqueam Park led to massive discounting of the price buyers were willing to pay for the leasing rights.

Discount preferences generally vary with the degree to which an individual is risk averse. Risk associated with assets comes in many forms: interest rate fluctuations (in the case of financial assets), unpredictable increases in liabilities associated with the asset, aging and death, and natural disaster (in the extreme case) provide examples. In the case of aging, the utility derived from the use of a house and property may decrease as an individual becomes less able to enjoy activities associated therewith, certainly so upon death. Individuals are generally not able to accurately predict the decline in utility that they will receive. The expectation is that older individuals will tend to have a higher discount rate, reflecting their understanding of the possibility that they may be unable in future to derive use from a given asset. This consideration is important considering the demographics of Musqueam Park: 70 percent of residents are retired while the other 30 percent are younger families, some with children.

This project will assume that individuals are rational decision-makers with risk-neutral preferences. The assumption of risk-neutrality is required in order to theoretically model the discount factor. Individuals who are risk-averse would tend to increase the discount they demand when purchasing risky investments. Risk-averse individuals would respond in the same manner to uncertainty surrounding the financial liabilities associated with leasing. If the magnitude of future financial liabilities is uncertain, risk-averse individuals facing possible increases will demand a greater discount than if the PDV of

The driving assumption behind a non-arbitrage consideration of property leasing is that the PDV of any of these payment structures will hold the same appeal to a buyer. *Ceteris paribus*, assuming that the expected value of discount rate does not deviate from expectations and that the future adjustments to lease payments are correctly anticipated, a buyer would be willing to lease using any of the above instruments: pre-payment, constant payment over the lease term, or variable payments over the lease term. In all cases the buyer receives exclusive usage of the lease property and derives appropriate utility irrespective of payment method. This condition may be formally described as:

$$R_{pre-paid} = R_{const} = R_{\text{var}\,iable} = f(u_i) \qquad (4)$$

A buyer under these conditions would be indifferent to the method by which they acquire a property's leasing rights.

2.3 Personal Time-Discount Preferences and Risk

Discount pricing is based on the law of one price.[11] This law states that *ceteris paribus* an individual will be indifferent to receiving a sum now or larger sum in the future, providing that the larger sum discounts to the amount of the sum offered in the current period. For example, an individual with a time-discount preference where $d = 0.05$ will view receiving \$1.00 in the future as worth the same as receiving \$0.95 now. More formally,

$$X_{\circ} = (1-d)^t X_t \qquad t = 0,\ldots,n$$

$$0 < d < 1$$

where X_o is a sum at the present date, d is the discount factor, and X_t is a sum t periods in the future. It is simple to see that sums received in the more distant future will hold much less value for an individual in the present.

Individuals hold differing preferences regarding the present value of utility they will derive from receiving goods at a future date. Some individuals may view future receipt of a good as holding little difference from having the good now. Most individuals, though, prefer to receive goods sooner than later. The farther away the date of receipt, the less useful that receipt appears. This is reflected in the magnitude of d – values close to unity indicate little time preference of receipt whereas values closer to zero indicate a preference for receiving goods now. As an extreme example, suppose an elderly individual wins the lottery and is given two options for collecting their prize: a lump sum (smaller than the advertised winning payout) now or a stream of payments over the next 25 years. Most likely, an individual will choose the lump sum – they have no guarantee that they will be alive to collect the winnings towards the end of the 25 years!

Assets which an individual values may not be in the form of physical goods, but instead as a stream of services. Flows of services or the rights to use certain physical

[11] See discussion of discounting and Law of One Price in Tuckman (1996), pp. 7-15.

power in this case and can choose among offers and select one that provides the greatest return.

Leasing decisions under these assumptions may be characterized mathematically. The simplest example is that of pre-paid leasing, such as that found in Salish Park, Champlain Heights, and in parts of False Creek. Pre-paid leasing in these areas involves a lump-sum payment with no subsequent financial obligations in return for the right of exclusive residential use of the leased property. In cases of pre-paid lease, the amount of the prepayment may be seen as representing the value to the buyer of the exclusive use of the leased property. Mathematically,

$$R_{pre-paid} = f(u_i) \qquad (1)$$

where $R_{pre-paid}$ is the amount of the pre-payment and $f(u_i)$ represents a function of the present discounted utility derived by an individual, *i*, from receiving exclusive use of the property. Leases requiring an annual payment that remains constant[10] over time may be represented by

$$R_{const} = P + \sum_{t=0}^{n} \frac{R_\circ}{(1+\partial)^t} \qquad (2)$$

where R_{const} is the sum of discounted payments, *P* is the initial payment made to purchase leasing rights to a property, $R_\circ$ represents the annual payment, ∂ is the time-preference discount rate, and *t* is the term of the lease, in years. As in the case of pre-paid leases, R_{const} represents the worth to a buyer of exclusive use of the lease property over the term of the lease.

It is often the case that lease payments involve adjustments at set dates during the lease term. Musqueam Park falls into this category of lease. Calculation of the PDV of leases with variable payments follows the same concept as a constant payment lease, but requiring a slightly more complicated discount procedure, shown in equation (3), to account for the variation.

$$R_{\text{var}\,iable} = P + \sum_{0 \le t < n_2} \frac{R_1}{(1+\partial)^t} + \sum_{n_b \le t < n_3} \frac{R_2}{(1+\partial)^t} + \ldots + \sum_{n_z \le t} \frac{R_z}{(1+\partial)^t} \qquad (3)$$

where $R_{\text{var}\,iable}$ is the sum of discounted payments, *P* is the initial payment made to purchase leasing rights to a property, $R_1 \ldots R_z$ are annual lease payments in a period, ∂ is the time-preference discount rate, $n_2 \ldots n_z$ are the ordinals assigned to the years in which new payments commence, and *t* is the term of the lease, in years.

[10] This situation is identical to renting a property, *ceteris paribus*, where the rent does not increase for a certain period of time.

Legal claims on the property and qualitative information such as the property's state of repair are examples of information that must be disclosed. Uncertainty or known risks associated with a property fall under the same requirement. In an ideal world of markets with perfect information, a buyer would be aware of all such factors and be able to make a fair offer based on their knowledge. This is the basis of *non-arbitrage pricing*. Ideally, every individual, vendor or buyer, will be privy to identical information and will trade assets based on that information. There is no opportunity for any one individual, through privately held information, to make an arbitrage profit. In the case of real-estate, a vendor will price the asset – namely the right to use a home and property in any manner they please – the same as the buyer would be willing to pay.[8]

When valuing an asset that provides a stream of services, such as use of property, over time it is necessary to determine the *present discounted value* (PDV) of the asset over the term of its use. This is accomplished by discounting to the present time the future value to an individual of receiving use of a house and property. Liabilities associated with an asset must also be discounted in order to calculate the net present discounted value of the asset. Liabilities include fees directly or indirectly arising from holding the asset – e.g. a house and property require periodic maintenance. The general process for calculating present discounted values and their use in non-arbitrage pricing is outlined below.

2.1 Non-Arbitrage Pricing and Present Discounted Values

This section will derive the mathematical model used to calculate a non-arbitrage model o lease payments. Explicit delineation of factors considered in PDV calculations will help the reader form a clearer picture of the process a home-buyer need consider.

Decision-making modeling in this study makes extensive use of the theory of non-arbitrage pricing. Non-arbitrage pricing is based on the assumption that a rational decision-maker will only pay exactly what a good or service is worth to them, no more. In the specific cases studied, it is assumed that an individual will pay for a lease the dollar-value of the flow of services/benefits they receive by holding the leasing rights. This assumption holds intuitively – a person would not pay more for goods or services than the utility they derive from those goods and services. The dollar-value of the flow of services/benefits is based on the individual's own preferences.

The value of the flow service/benefits may, however, be biased by restrictions on the individual's available choices. For instance, in Musqueam and Salish Park, liquidity constraints may prevent certain sections of the population from financing the purchase of leasing rights.[9] In this example, prices partially depend on the availability of financing. The vendor of the leasing rights will demand a premium for accepting longer-term financing plans that accommodate buyers with liquidity constraints. Individuals who have ready access to adequate financing will be in better position than those with liquidity restrictions since they can avoid financing premiums demanded by the seller. This study assumes that the eventual price set for a lease is exactly the same as the seller's valuation of the leasing rights. The leasing right is effectively a scarce resource (Vancouver real-estate) with many potential buyers. The seller holds the bargaining

[8] This, of course, assumes identical preferences regarding the use of the asset.
[9] This is a form of selection bias.

properties. Sales of Musqueam Park lease rights promulgated this notion into the early 1990s. Ownership of lots and improvements in Musqueam Park rests with the Musqueam Indian Band. The Musqueam Indian Band also owns fixed improvements built by leaseholders. Leaseholders, instead of gaining ownership of the homes they built, were able to write off the costs involved in the improvements they made to the leasehold properties. Tax write-offs for fixed-improvements meant that leaseholders were fully compensated for the costs incurred at the time they made improvements to their properties.

The phrase "6 percent of current land value" became central to renegotiation of annual lease payments. In 1995, the Musqueam Indian Band issued notices stating that annual lease payments would increase to amounts of $28,000 to 38,000 per year.[6] This value was based on 6 percent of the *assessed* value of Musqueam Park properties and their improvements. The Musqueam Park Leaseholders Association challenged the new lease payments in the first level of federal court, alleging that the new lease payments did not fit either the "fair rent" or the "6 percent of current land value" specifications stipulated by their lease agreements. The Musqueam Park Leaseholders Association was granted reprieve, with payments set October 10, 1997, at an average of $10,000 annually[7], but it proved to be temporary. The Musqueam Indian Band appealed this judicial decision in the Federal Court of Appeal and won an increase, not to the initial $38,000 per year level, but to approximately $22,400 per year on average. The Musqueam Park Leaseholders Association is currently appealing this latest decision.

1.3 Statement of Purpose

This study is concerned with how buyers make pricing decisions concerning leasing in Musqueam Park and Salish Park, focusing on differential discounting behaviour between the areas. Musqueam and Salish Park face continuing payment and pre-paid lease encumberances, respectively. Comparison will entail examining the differences in discounting behaviour between continuing payment and prepaid leases. A comparison group of freehold properties located in the non-Agricultural Land Reserve area of Southlands (hereafter Southlands) and the King Edward region of Dunbar (hereafter simply King Edward region) is used to impute hypothetical non-arbitrage lease prices as a means of calculating discount behaviour specific to each area. The aim is to provide estimates of the magnitudes of combined factors affecting discounting in Musqueam and Salish Park. These primary issues will be addressed in the course of this paper.

2 Asset Pricing Theory and Related Concepts

Real-estate transactions are governed by rules of disclosure whereby a vendor must advise a potential purchaser of any information directly affecting the value of a property.

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[6] Kesselman, Jon. *Impasse at Musqueam: History and Economics of the Lease Dispute*. Vancouver Sun, 19 March 1999, p. A13

[7] Chapman, Kerry-Lynne D. ibid p. 10

incomes implied an average household payment increasing from approximately $390 to $480 per year. Salish Park leaseholds were offered on the basis of pre-paid leases, eliminating the need for future adjustments as in the case of Musqueam Park. Pre-payment amounts ranged from $18,000 to $32,963.

The tax trust fund was established in order to guarantee payment of Musqueam Park property taxes to the City of Vancouver. This was considered a necessity due to the unique circumstances of the lease agreements that the Musqueam Indian Band would eventually hold with the public.[5] Initial servicing of the subdivision was to be the responsibility of the City of Vancouver for which they would collect property tax from the leaseholders to cover costs. The City of Vancouver desired the tax trust fund as a guarantee that their tax revenue would be covered in the event of non-payment by one or more leaseholders. Under normal circumstances non-payment would lead to tax-sale of property owned by individual(s) in default. Since the properties in Musqueam Park are not owned by the leaseholders, the City of Vancouver would be without recourse to recover its costs. The purpose of the tax trust fund, then, was to provide a measure of revenue security to the City of Vancouver. (Upon expiry of the leases, the fund reverts to the Musqueam Indian Band.)

As the terms of the Musqueam Park leases progressed, property values in adjacent areas increased. The $480 per year rent level became a very attractive feature to potential buyers as assessed values of the properties often reached $500,000 and more in the early 1990s. Eventually, the *leasehold* (rights of use granted under lease for a limited period of time) properties were changing hands for large sums equivalent to the prices paid for similar *freehold* (owned outright by a purchaser) lands in adjacent areas (i.e. King Edward region in Dunbar and non-Agricultural Land Reserve areas of Southlands). Since the annual rents paid by owners of the leasing rights were tiny in comparison to the value of the properties, there was necessarily a large premium paid by new lessees for such a fantastic deal. This premium brought the price paid to acquire rights to leasehold properties into line with comparable freehold developments. The premium was effectively an adjustment to the price of acquiring the flow of services represented by the leasing rights (i.e. use of the homes and properties in Musqueam Park).

The illusion created by the commonly held perception that the conditions around the leases would persist led to high purchase prices ($450,000 to 600,000 in 1989-90) for the right to lease properties in Musqueam Park. Leaseholders in Musqueam Park felt that the $480 per year rent level would remain at similar levels throughout the term of their leases. Consideration of the re-evaluation clause by Musqueam Park leaseholders led to speculation that rents could increase by a 'liberal' 200-300 percent, based on 6 percent of the value of *undeveloped* Musqueam Park lots in 1995. Such an increase, were it to take place, was still considered to be a very good situation for Musqueam Park leaseholders. Renting comparable freehold properties (which often rented for $2000-3000/month) at a rate of $800-1200 per year was considered a favorable situation.

Leaseholders in Musqueam Park treated their leaseholdings as if they were equity in the same sense that a freehold property would be. Leaseholders expected to be able to sell 'their' property and homes for amounts comparable to the market prices for freehold

[5] The proposed lease development was among the first of its kind in Canada.

1 INTRODUCTION

In the late 1950s, entrepreneurial efforts by the late developer Bud Kelly led to the proposed subdivision of a 38-acre parcel of land contained by Musqueam Indian Reserve #2 (see Appendix B – Maps). The proposed development was to be utilized for single-family housing (and some duplexes) in which leasing interests were to be tendered to the public. On February 17th, 1960, the Musqueam Indian Band surrendered the land in question to the Government of Canada "in trust to lease"[1]. At no time was there a transfer of ownership of the land from the Musqueam to Government of Canada. The 'surrender' of Musqueam reserve land was a legal necessity to allow leasing of the land under the Indian Act.

On June 8th, 1965, Musqueam Development Co. Ltd., official developer of the subdivision, concluded a leasing agreement with the Government of Canada. Musqueam Development Co. Ltd. was wholly owned by members of the Musqueam Indian Band. In 1966 Musqueam Development Co. Ltd. shareholders sold their interests in the leasing agreement to Block Brothers Co. Ltd., the eventual developer. The subdivision, called Musqueam Park, totaled 75 households with basic services to be provided by the City of Vancouver under a contract with the Musqueam Indian band. An adjacent 50-acre tract of land was surrendered in 1970 to the Government of Canada for the development of 144 additional leasehold properties. This new subdivision became what is now known as Salish Park.

Musqueam Park lease terms were for 99-years with a clause allowing for renegotiation of the lease rents after 30 years to reflect the market value of adjacent properties. The Musqueam Indian Band's agreement with the developer entailed certain considerations to be paid to the band until such time as the annual lease payments could be renegotiated. These considerations included guaranteed annual rental incomes and the establishment of a tax trust fund[2]. Guaranteed aggregate rental incomes were:

- $23,422 per year until 18 February, 1969
- $24,602 per year for 10 years from 19 February, 1969
- $27,062 per year for 10 years from 19 February, 1979
- $29,522 per year until 23 June, 1995

During each of the three decades leading up to 1995, rents were adjusted slightly upwards, with increases totaling approximately 30 percent. These figures were based on calculations that lands values would increase by about 1 percent annually, as had been the historical experience on Vancouver's west side.[3] Renegotiation of lease payments was to be based on setting "an annual clear total rental which represents six percent (6 percent) of the current land value, calculated at the time of renegotiation…"[4] The guaranteed

[1] Chapman, Kerry-Lynne D., "Musqueam Backgrounder", January 1, 1999, p.1 (unpublished)
[2] The developer was required to fulfill several additional obligations detailed in Federal Lease Agreement #5385 between Her Majesty the Queen and Musqueam Development Company Ltd.
[3] Chapman, Kerry-Lynne D. ibid p. 3-4
[4] Federal Lease Agreement #5385. ibid paragraph 2 (4)

Purchaser Discounting Behaviour

In

Musqueam and Salish Park, 1980-98

An applied economics study
by

Derek Armstrong

at the University of British Columbia

April 2000
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NOTE:
This draft will undergo future revisions and extensions. Please do not quote without contacting the author for the most recent version. The author may be contacted by e-mail at armstrong@excite.com