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Working Paper 7: Defining and Analysing London's Housing Submarkets

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Abstract

This working paper divides London's housing market into five submarkets based on structural, accessibility and household characteristics. The submarkets were defined by clustering four influential variables obtained by using a stepwise selection process. The stepwise process balances the residual sum of squares (RSS) with the number of variables to find the best fitting model. Each cluster is discussed in more detail by undertaking a hedonic pricing analysis of the most significant variables in each. The overall housing market is then compared with the submarket analysis using the quality of fit to the data, as determined by the RSS. This working paper also presents statistical results on correlation, cluster averages and tests for multicollinearity.

Introduction

The London housing market is inherently complex and defining a consistent set of submarkets is a difficult task. A mismatch between demand and supply and a relative high housing search time compared to most European Union cities creates housing submarket inefficiencies. This leads to the housing market not being able to clear its excess demand or supply instantly. The degree of distinction between submarkets determines how quickly markets can adjust. A low level of housing substitutability (the ease with which one good can be substituted for another) between submarkets, which may arise due to differences in housing and household attributes, means that the submarkets have a higher level of stability. This is because a prospective homebuyer has less choice in a submarket other than their preferred one. A buyer is more likely to maintain a housing search in one particular submarket, as others are not easily substitutable. This reduces search times and enables the market to get back into equilibrium faster (Tu, 2003).

A housing segment (eg one type of property) becomes a housing submarket if its hedonic prices[1] are statistically significantly different from the ones in the rest of the housing segments (Goodman and Thibodeau, 1998).

Housing submarket analysis should provide greater explanatory power and accuracy than studies at the overall market level. This is based on the assumption that submarkets will have lower variance and are expected to provide a higher level of statistical explanation.

This working paper contains the statistical and econometric analysis of the results in *London's Housing Submarkets* (GLA Economics, 2004).

Literature background on housing submarkets

Theoretical work on urban housing models date back to the 1960s. Adair et al (1994) present a useful outline of housing submarket and hedonic pricing models compared with overall housing market models. Maclennan (1982) even advocated that housing submarkets in urban areas should be adopted as a working hypothesis. Identification of submarkets is the main issue for developing a submarket model. Watkins (1998) presented housing segmentation on the basis of spatial, structural and nested spatial/structural characteristics. More recently, Bourassa et al (1999) used a more systematic method based on principal component analysis (PCA) and clustering to identify submarkets.

[1] Hedonic modelling is based on the proposition that the price of a house is based on various attributes such as geographic location, socio-economic characteristics and accessibility to services.

Housing submarket identification has important implications for housing market analysis. A wide range of studies indicates that submarkets do exist. A well-defined urban housing submarket structure is particularly important for the following purposes:

- applying the hedonic technique to property valuation (Adair, Berry and McGreal 1996; Watkins 1998)
- in the construction of property indices (Berry, Chung and Waddell 1995)
- for housing market planning (Jones and Watkins 1999)
- in the evaluation of urban policy initiatives.

1. Methods for identifying submarkets

Submarkets can be identified on an ad hoc or systematic basis. The idea is to have a simple model with as few submarkets as is reasonable. Attributes should be as similar as possible within a submarket and different across submarkets.

Patterns of substitutability are linked to:

- price
- search costs
- desired proximity to facilities and work
- environmental quality
- ethnic segregation
- demand for the attributes of an individual house.

The prices in the hedonic equations are the result of the interaction between these demand functions and short-run supply functions to produce varying attribute prices (hedonic prices) among submarkets. Different equations should be, or can be, estimated for each submarket. A stepwise option such as forward selection of variables,[2] backward elimination or a combination of both can be used to develop the equation from all variables based on their statistical significance.[3]

1.1 Ad hoc methods

Submarkets can be identified by:

- geographic location (spatial submarkets), for example areas grouped by postcodes
- house type (structural submarkets), for example flats, detached and terraced houses
- tenure type, for example owner-occupied or private rented.

However, there is no strong basis to assume that dwellings based on the above classifications are homogenous in the areas grouped for analysis. A neighbourhood profile can contain all types of houses and/or income groups in one geographic area. The structural submarket nested within a geographic location can be further sub-divided (eg NW1 detached compared to SW2 terraced).

1.2 Systematic method

A more systematic method to form submarkets has been proposed by Bourassa et al (1999). They advocate principal component analysis (PCA) or factor analysis to identify factors/variables for classifying submarkets. Cluster analysis[4] can be used to form

[2] Forward selection of variables involves adding variables one at a time and seeing whether or not they improve the fit of the data.
[3] Using explanatory variables, which provide the best or optimum level of explanation following rejection of variables displaying high levels of multicollinearity.
[4] Clustering is the classification of a number of observations into a few groups on the basis of the individual characteristics.

homogenous groups. Hedonic pricing techniques can then be used to determine whether the submarkets are distinct.

PCA or factor analysis is a procedure that derives a small number of linear combinations (the principal components or factors) of the original variables whilst retaining a substantial amount of the information contained in those variables. The PCA is also interesting in its own right because it identifies the basic dimensions that distinguish housing submarkets.

Cluster analysis is a procedure for allocating observations to groups, based on the data rather than on a pre-set classification. Observations in a cluster tend to be similar to one another but different from observations in other clusters.

One drawback of this method is that dwellings located far apart may be grouped into one market segment. In other words, there can be a lack of compactness in the submarket.

2. Methodology

In order to identify London's housing submarkets, a systematic method to identify key variables from the dataset (given in the appendix) was used. A cluster analysis was subsequently performed to group them into submarkets.

Overall house prices was regressed on all influential variables from the dataset.[5] The most important variables to define the clusters were identified using a stepwise selection process. The explanatory power of any model can be evaluated by its quality of fit to the data, as determined by the residual sum of squares (RSS),[6] and the number of variables used (where having more variables is considered unfavourable). The stepwise process balances the RSS with the number of variables to find the best possible model. For efficiency of calculation, the process is iterative. Starting with a given model, all possible variables outside the model are individually considered for inclusion, and all variables inside the model considered for exclusion. If an improvement on the model can be made then the model is updated. This step process is repeated until no further improvements can be found.

The variables obtained to identify the clusters, or submarkets, are:
1. travel time by public transport to central London
2. percentage of households in private rented accommodation
3. average number of rooms per household
4. percentage of Income Support claimants.

Five submarkets have been constructed on the basis of these four variables. These variables are correlated with other variables in the dataset to describe the submarkets.

2.1 Cluster results

Tables 1a and 1b give the average value for each variable for the respective cluster. In Table 1a, the averages were calculated omitting house prices. In Table 1b, overall house prices were added as a fifth variable. The house price cluster averages in Table 1b can be compared to the calculated average overall house price for Table 1a (shaded column). This is calculated by taking the average of the house prices in each cluster (eg average of 130 postcode sectors in the Central submarket). The calculated average house prices in Table 1a (except for Pleasant Crescent and Leafy Retreat) are very close to the average house prices in Table 1b. This means that the submarkets created by housing attributes (which affect house prices) closely match the submarkets when house prices are included.

[5] List of variables given in Appendix A.
[6] Residual or unexplained variation of the Y values about the regression line (Σe_i^2).

Table 1a. Cluster averages: without house prices (924 postcode sectors)

Cluster name	Travel time by public transport (min)	Private rented %	Average rooms per household	Income support %	No of postcode sectors	Calculated average house price (£s)
Central	5.21	45.96	3.80	6.99	130	458,821
Crowded House	19.78	19.15	4.08	12.75	174	219,199
Pleasant Crescent	29.99	23.86	4.57	8.41	171	258,148
Suburban London	40.86	14.28	5.01	7.03	253	188,467
Leafy Retreat	45.49	10.37	5.80	4.06	196	273,107

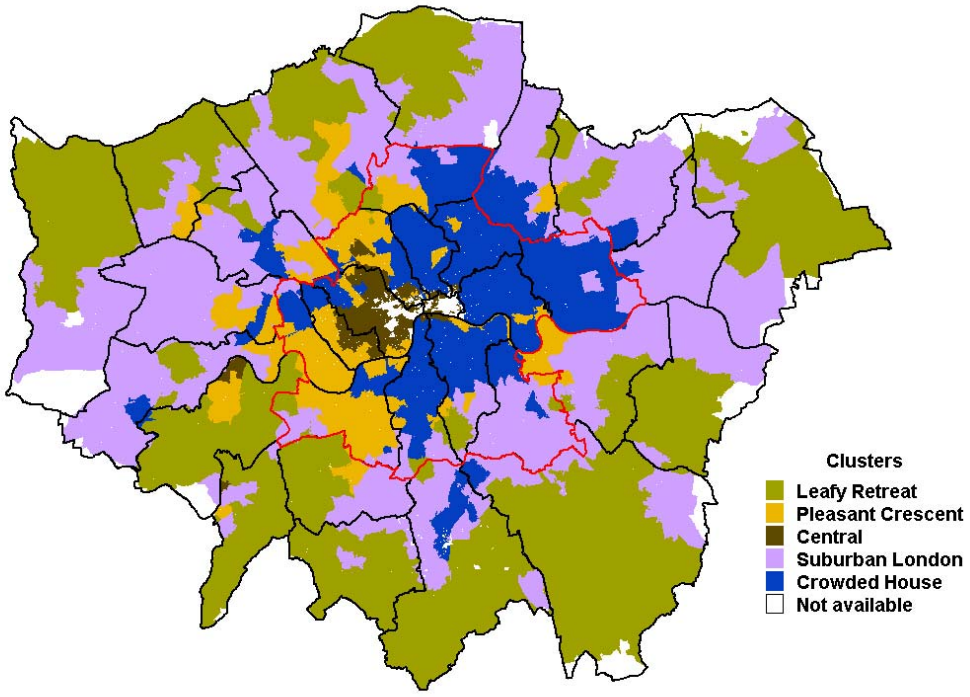
Note: Within group sum of squares: 0.09824641
Mean entropy: 0.06256722
Observations used: 924

Table 1b. Cluster averages: including house prices (924 postcode sectors)

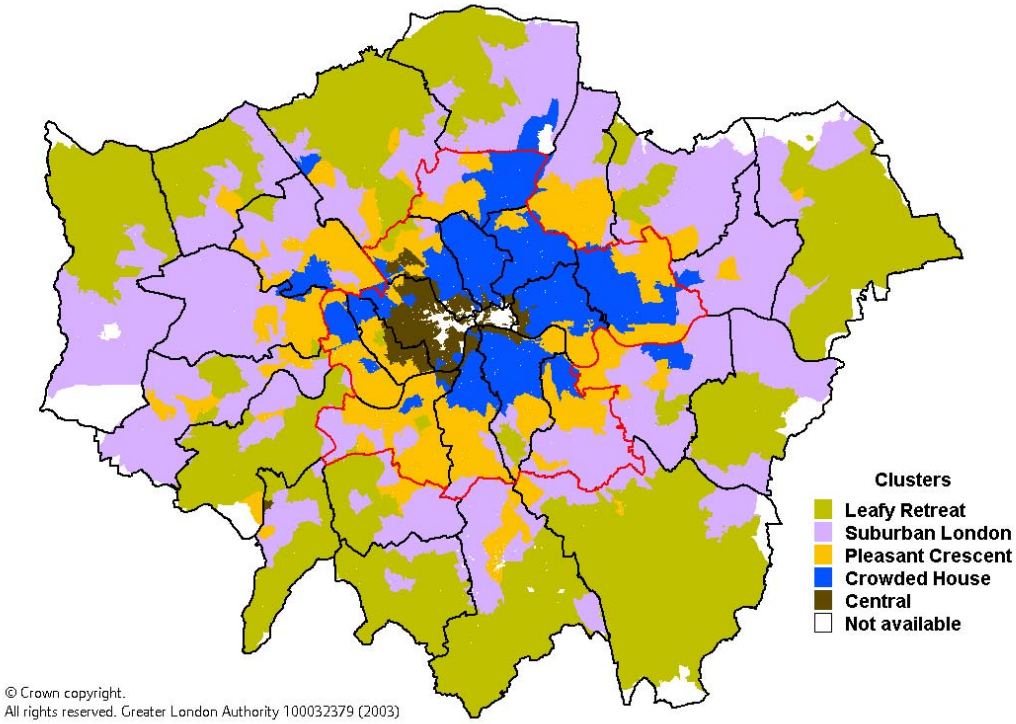
Cluster name	Average house prices (£s)	Travel time by public transport (min)	Private rented %	Average rooms per household	Income support %	No. of postcode sectors
Central	445,966	6.75	45.06	3.89	6.99	131
Crowded House	230,451	19.55	20.83	4.09	12.13	213
Pleasant Crescent	327,686	36.86	20.13	5.47	5.04	103
Suburban London	184,794	37.41	16.79	4.75	8.37	265
Leafy Retreat	216,133	45.13	10.54	5.49	4.79	212

Note: Within group sum of squares: 0.1099735
Mean entropy: 0.6917068
Observations used: 924

Map 1. Five submarkets: including house prices



Map 2. Five submarkets: without house prices



3. Detailed analysis of each submarket

A hedonic regression model was used to analyse each submarket in detail. The coefficients of the model can be interpreted as the submarket's implicit valuations of the housing attributes.

A log-linear functional form is used for the hedonic modelling, which has the following advantages:

- Simple and appealing interpretation. The coefficient can be interpreted as approximately the percentage change in the house value given a unit change in the independent variable.
- Mitigates the problem of hetroskedasticity (changing variance of the error term).
- Computationally simple.
- Flexible, as dummy variables can be used.
- It allows for variation in the pound value of a particular characteristic so that the price of one component/attribute depends in part on the house's other characteristics.[7]

However, one drawback of the log-linear model is that the anti-log of the predicted log house price does not give an unbiased estimate of predicted price.

A stepwise option such as forward selection of variables, backward elimination or a combination of both has been used to develop the hedonic equation from all variables[8] based on their statistical significance. A balance has to be struck between the number of variables used in the model and reducing multicollinearity.[9] The five most significant variables for each cluster were selected using this method.

The hedonic log-linear equation is given by:

$$\ln HP = \alpha_0 + \beta_i \sum_{i=1}^{5} X_i + e_i$$

where HP is average house prices in postcode sectors

α_0 is the intercept

β_i are the coefficients of the indicators or a vector of unknown parameters to be estimated

X_i are the five significant variables used to explain the variation in house prices

e_i is the error term

[7] However, if postcode or ward level data is used, then this is less important as the price of one component/attribute is not unique to any individual property but common to a group of properties.
[8] A list of the variables is in Appendix A.
[9] Multicollinearity is the undesirable situation where the correlations among the independent variables are strong, that is the effect of explanatory variables is strong and it becomes difficult to isolate the significance of any one variable.

3.1 Submarket 1: Central

The most significant variables that explain the variation in house prices using this systematic selection process are (in the order of significance):

1. Overcrowded households
2. Households living in flats/maisonettes
3. People in full time employment
4. Average Key Stage 3 point score in 2002 for schools within a radius of 2km
5. People aged between 30 to 64 years.

Table 2. Model summary

R	R Square	Adjusted R Square	Standard error of the estimate
0.73	0.54	0.52	0.33

R (0.73), the multiple correlation coefficient, shows a strong correlation between the observed and predicted values of the dependent variable (home sale price).

R^2 (0.54), the coefficient of determination, is the squared value of the multiple correlation coefficient. It shows that about half of the variation in home sale prices is explained by the five variables. In this case these variables do not provide a very good fit to the model. This is because there are many other factors that affect house prices in the central cluster; for example, river views increase the value of some properties.

Table 3. Analysis of variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	15.69	5	3.14	28.49	.000
Residual	13.66	124	.11		
Total	29.34	129			

The significance value of the F statistic is less than 0.05 and highly significant. The F statistic is the regression mean square (MSR) divided by the residual mean square (MSE). The null hypothesis that home sale price is not linearly related to all the explanatory variables can be rejected. The regression sum of squares (RSS) 15.7 is nearly the same as the residual sum of squares (RSS) 13.7, indicating that the model does not account for most of the variation in average home sale prices (the dependent variable).

Table 4. Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig	95% Confidence Interval for B		Correlations			Collinearity statistics	
	B	Standard error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	13.16	0.67		19.53	0.00	11.82	14.49					
Overcrowded households	-0.02	0.00	-0.46	-5.92	0.00	-0.03	-0.02	-0.62	-0.47	-0.36	0.63	1.58
Households: Flats/maisonettes	-0.01	0.00	-0.23	-3.07	0.00	-0.02	0.00	-0.52	-0.27	-0.19	0.67	1.49
Average KS3 scores	0.05	0.02	0.19	2.80	0.01	0.01	0.08	0.42	0.24	0.17	0.78	1.28
People aged 30-64 years	0.01	0.00	0.15	2.14	0.03	0.00	0.02	0.25	0.19	0.13	0.77	1.30
Full-time employed	-0.01	0.00	-0.20	-2.97	0.00	-0.02	0.00	-0.09	-0.26	-0.18	0.80	1.25

The explanatory variables all have the expected signs and significant t-statistics at the 95 per cent confidence interval. House prices are negatively related with the proportion of people in full time employment, as a high proportion of people are self employed in this cluster and the proportion of people who are self employed is positively related with house prices. The significant variables have been ranked for this cluster on the basis of the standardised coefficients.[10]

The tolerance[11] is the percentage of the variance in a given predictor that cannot be explained by the other predictors. When tolerances are close to 0, there is high multicollinearity and the standard error of the regression coefficients will be inflated. A variance inflation factor (VIF)[12] greater than 2 is usually considered problematic and greater than 3 indicates serious multicollinearity problem.

[10] Standardised coefficients enable us to compare the relative importance of the explanatory variables. If we converted the data to z-scores before we ran the regression, we would have obtained beta as our unstandardised coefficients. Larger absolute standard coefficient values indicate greater contribution in explaining the model.
[11] A statistic used to determine how much the independent variables are linearly related to one another (multicollinear). It is the proportion of a variable's variance not accounted for by other independent variables in the equation. A variable with very low tolerance contributes little information to a model, and can cause computational problems. It is calculated as 1 minus R squared for an independent variable when it is predicted by the other independent variables already included in the analysis.
[12] VIF is the reciprocal of the tolerance. As the variance inflation factor increases, so does the variance of the regression coefficient, making it an unstable estimate. Large VIF values are an indicator of multicollinearity.

To check if multicollinearity is a serious problem in any regression, the frontier of R, the multiple correlation coefficient, is often used. As a rule of thumb, if $R \geq 0.9$ then multicollinearity may be considered harmful and if $R \leq 0.9$ then it is not harmful. In this case R from Table 2 is 0.73 so multicollinearity is not considered a serious problem.

Table 5. Correlations

		Log of house prices	Over-crowded households	Households: Flats/ maisonettes	Average KS3 scores	People aged 30-64 years	Full-time employed
Pearson Correlation	Log of house prices	1.00	-0.62	-0.52	0.42	0.25	-0.09
	Overcrowded households	-0.62	1.00	0.48	-0.32	-0.20	-0.21
	Households: Flats/maisonettes	-0.52	0.48	1.00	-0.18	0.03	0.19
	Average KS3 scores	0.42	-0.32	-0.18	1.00	0.39	0.12
	People aged 30-64 years	0.25	-0.20	0.03	0.39	1.00	0.30
	Full-time employed	-0.09	-0.21	0.19	0.12	0.30	1.00
Sig. (1-tailed)	Log of house prices	.	0.00	0.00	0.00	0.00	0.17
	Overcrowded households	0.00	.	0.00	0.00	0.01	0.01
	Households: Flats/maisonettes	0.00	0.00	.	0.02	0.35	0.02
	Average KS3 scores	0.00	0.00	0.02	.	0.00	0.10
	People aged 30-64 years	0.00	0.01	0.35	0.00	.	0.00
	Full-time employed	0.17	0.01	0.02	0.10	0.00	.

Pearson correlation coefficients assume the data are normally distributed and is a measure of linear association between two variables. The values of the correlation coefficient range from -1 to 1. The sign of the correlation coefficient indicates the direction of the relationship (positive or negative). The absolute value of the correlation coefficient indicates the strength, with larger absolute values indicating stronger relationships. The significance of each correlation coefficient is also displayed in the correlation table. If the significance level is very small (less than 0.05) then the correlation is significant and the two variables are linearly related. Most correlations are significant with the exception of people aged 30-64 years and households living in flats/maisonettes.

Table 6. Overall Correlations[13]

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
House price	1.00	0.15	0.63	-0.32	0.31	0.31	-0.10	0.29	0.35
Private rented %	0.15	1.00	0.05	-0.40	-0.16	0.30	0.38	-0.07	-0.05
Average rooms per household	0.63	0.05	1.00	-0.43	0.44	0.21	-0.20	0.58	0.57
Income Support claimants %	-0.32	-0.40	-0.43	1.00	-0.33	-0.38	-0.07	-0.12	-0.28
Public transport travel time (mins)	0.31	-0.16	0.44	-0.33	1.00	0.10	-0.13	0.46	0.67
Ethnic group: white %	0.31	0.30	0.21	-0.38	0.10	1.00	0.51	0.02	0.09
Economically active %	-0.10	0.38	-0.20	-0.07	-0.13	0.51	1.00	-0.11	-0.11
Households: detached %	0.29	-0.07	0.58	-0.12	0.46	0.02	-0.11	1.00	0.67
Households: semi-detached %	0.35	-0.05	0.57	-0.28	0.67	0.09	-0.11	0.67	1.00
Households: terraced %	0.50	-0.07	0.71	-0.37	0.41	0.16	-0.26	0.30	0.40
Households: flats /maisonettes %	-0.52	0.09	-0.79	0.38	-0.54	-0.14	0.25	-0.55	-0.64
Households: owner-occupied %	0.20	-0.32	0.39	-0.34	0.47	0.30	0.03	0.21	0.41
Households: social rented %	-0.30	-0.70	-0.35	0.63	-0.20	-0.50	-0.39	-0.09	-0.26
Average household size	0.15	-0.33	0.54	0.05	0.38	-0.56	-0.47	0.43	0.32
Overcrowded households %	-0.62	-0.15	-0.81	0.32	-0.27	-0.43	-0.12	-0.40	-0.40
One-person households %	-0.25	0.21	-0.65	0.02	-0.41	0.26	0.24	-0.44	-0.37
Couples with dependent children %	0.25	-0.28	0.63	-0.14	0.50	-0.35	-0.42	0.51	0.47
Green spaces less than 1.5km	-0.08	0.01	-0.08	0.26	-0.24	-0.02	0.09	0.15	0.03
British Rail and London Underground less than 1.5km	-0.47	0.17	-0.60	0.34	-0.66	-0.05	0.30	-0.28	-0.50
Schools less than 2km	0.22	-0.19	0.40	-0.19	0.62	-0.10	-0.11	0.34	0.51
Average KS3 scores	0.42	0.30	0.27	-0.42	0.15	0.55	0.14	-0.09	0.02
People aged 0-19 years %	0.01	-0.27	0.41	-0.03	0.27	-0.40	-0.55	0.31	0.25

[13] Variables are explained in Appendix A.

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
People aged 20-29 years %	-0.53	0.10	-0.54	0.24	-0.13	-0.33	0.15	-0.28	-0.26
People aged 30-64 years %	0.25	0.20	-0.02	-0.12	-0.17	0.52	0.48	-0.09	-0.04
People aged 65 above years %	0.44	-0.12	0.35	-0.16	0.11	0.24	-0.26	0.19	0.15
Part-time employment %	0.17	-0.23	0.30	0.12	0.12	-0.23	-0.22	0.26	0.10
Full-time employment %	-0.09	0.34	-0.10	-0.12	-0.05	0.51	0.89	-0.02	-0.04
Self-employment %	0.23	0.23	0.05	-0.13	-0.10	0.39	0.34	-0.08	0.00
Total employment %	0.04	0.39	-0.04	-0.16	-0.08	0.62	0.97	-0.02	-0.02

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
House price	0.50	-0.52	0.20	-0.30	0.15	-0.62	-0.25	0.25	-0.08	-0.47
Private rented %	-0.07	0.09	-0.32	-0.70	-0.33	-0.15	0.21	-0.28	0.01	0.17
Average rooms per household	0.71	-0.79	0.39	-0.35	0.54	-0.81	-0.65	0.63	-0.08	-0.60
Income Support claimants %	-0.37	0.38	-0.34	0.63	0.05	0.32	0.02	-0.14	0.26	0.34
Public transport travel time (mins)	0.41	-0.54	0.47	-0.20	0.38	-0.27	-0.41	0.50	-0.24	-0.66
Ethnic group: white %	0.16	-0.14	0.30	-0.50	-0.56	-0.43	0.26	-0.35	-0.02	-0.05
Economically active %	-0.26	0.25	0.03	-0.39	-0.47	-0.12	0.24	-0.42	0.09	0.30
Households: detached %	0.30	-0.55	0.21	-0.09	0.43	-0.40	-0.44	0.51	0.15	-0.28
Households: semi-detached %	0.40	-0.64	0.41	-0.26	0.32	-0.40	-0.37	0.47	0.03	-0.50
Households: terraced %	1.00	-0.95	0.39	-0.23	0.41	-0.42	-0.42	0.49	-0.24	-0.59
Households: flats/maisonettes %	-0.95	1.00	-0.45	0.25	-0.46	0.48	0.48	-0.59	0.16	0.63
Households: owner-occupied %	0.39	-0.45	1.00	-0.44	0.08	-0.24	-0.19	0.16	-0.12	-0.40
Households: social rented %	-0.23	0.25	-0.44	1.00	0.26	0.33	-0.05	0.14	0.07	0.14
Average household size	0.41	-0.46	0.08	0.26	1.00	-0.24	-0.87	0.91	-0.15	-0.46
Overcrowded households %	-0.42	0.48	-0.24	0.33	-0.24	1.00	0.50	-0.33	-0.01	0.43
One-person households %	-0.42	0.48	-0.19	-0.05	-0.87	0.50	1.00	-0.81	0.16	0.51
Couples with dependent children %	0.49	-0.59	0.16	0.14	0.91	-0.33	-0.81	1.00	-0.19	-0.57
Green spaces less than 1.5km	-0.24	0.16	-0.12	0.07	-0.15	-0.01	0.16	-0.19	1.00	0.18

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
British Rail and London Underground less than 1.5km	-0.59	0.63	-0.40	0.14	-0.46	0.43	0.51	-0.57	0.18	1.00
Schools less than 2km	0.46	-0.55	0.32	-0.06	0.51	-0.24	-0.46	0.64	-0.25	-0.56
Average KS3 scores	0.25	-0.18	0.03	-0.31	-0.22	-0.32	0.10	-0.10	-0.20	-0.21
People aged 0-19 years %	0.32	-0.36	-0.03	0.27	0.68	-0.11	-0.54	0.75	-0.17	-0.26
People aged 20-29 years %	-0.43	0.44	-0.25	0.09	0.00	0.47	-0.01	-0.11	-0.07	0.28
People aged 30-64 years %	-0.01	0.03	0.17	-0.32	-0.55	-0.20	0.42	-0.51	0.16	0.12
People aged 65 years above %	0.29	-0.29	0.17	-0.01	-0.03	-0.29	0.05	0.01	0.08	-0.30
Part-time employment %	0.18	-0.19	-0.04	0.25	0.47	-0.21	-0.45	0.40	-0.04	-0.23
Full-time employment %	-0.23	0.19	0.03	-0.34	-0.34	-0.21	0.11	-0.26	0.03	0.20
Self-employment %	0.10	-0.06	0.23	-0.39	-0.43	-0.12	0.34	-0.40	0.11	0.12
Total employment %	-0.15	0.13	0.12	-0.46	-0.44	-0.27	0.19	-0.37	0.07	0.21

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
House price	0.22	0.42	0.01	-0.53	0.25	0.44	0.17	-0.09	0.23	0.04
Private rented %	-0.19	0.30	-0.27	0.10	0.20	-0.12	-0.23	0.34	0.23	0.39
Average rooms per household	0.40	0.27	0.41	-0.54	-0.02	0.35	0.30	-0.10	0.05	-0.04
Income Support claimants %	-0.19	-0.42	-0.03	0.24	-0.12	-0.16	0.12	-0.12	-0.13	-0.16
Public transport travel time (mins)	0.62	0.15	0.27	-0.13	-0.17	0.11	0.12	-0.05	-0.10	-0.08
Ethnic group: white %	-0.10	0.55	-0.40	-0.33	0.52	0.24	-0.23	0.51	0.39	0.62
Economically active %	-0.11	0.14	-0.55	0.15	0.48	-0.26	-0.22	0.89	0.34	0.97
Households: detached %	0.34	-0.09	0.31	-0.28	-0.09	0.19	0.26	-0.02	-0.08	-0.02
Households: semi-detached %	0.51	0.02	0.25	-0.26	-0.04	0.15	0.10	-0.04	0.00	-0.02
Households: terraced %	0.46	0.25	0.32	-0.43	-0.01	0.29	0.18	-0.23	0.10	-0.15
Households: flats/maisonettes %	-0.55	-0.18	-0.36	0.44	0.03	-0.29	-0.19	0.19	-0.06	0.13
Households: owner-occupied %	0.32	0.03	-0.03	-0.25	0.17	0.17	-0.04	0.03	0.23	0.12

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
Households: social rented %	-0.06	-0.31	0.27	0.09	-0.32	-0.01	0.25	-0.34	-0.39	-0.46
Average household size	0.51	-0.22	0.68	0.00	-0.55	-0.03	0.47	-0.34	-0.43	-0.44
Overcrowded households %	-0.24	-0.32	-0.11	0.47	-0.20	-0.29	-0.21	-0.21	-0.12	-0.27
One-person households %	-0.46	0.10	-0.54	-0.01	0.42	0.05	-0.45	0.11	0.34	0.19
Couples with dependent children %	0.64	-0.10	0.75	-0.11	-0.51	0.01	0.40	-0.26	-0.40	-0.37
Green spaces less than 1.5km	-0.25	-0.20	-0.17	-0.07	0.16	0.08	-0.04	0.03	0.11	0.07
British Rail and London Underground less than 1.5km	-0.56	-0.21	-0.26	0.28	0.12	-0.30	-0.23	0.20	0.12	0.21
Schools less than 2km	1.00	-0.09	0.41	-0.09	-0.23	-0.01	0.09	0.04	-0.24	-0.06
Average KS3 scores	-0.09	1.00	-0.17	-0.35	0.39	0.16	-0.08	0.12	0.28	0.22
People aged 0-19 years %	0.41	-0.17	1.00	-0.04	-0.67	-0.17	0.22	-0.36	-0.49	-0.52
People aged 20-29 years %	-0.09	-0.35	-0.04	1.00	-0.54	-0.69	-0.26	0.21	-0.44	-0.02
People aged 30-64 years %	-0.23	0.39	-0.67	-0.54	1.00	0.19	-0.10	0.30	0.64	0.55
People aged 65 years and above %	-0.01	0.16	-0.17	-0.69	0.19	1.00	0.28	-0.33	0.34	-0.14
Part-time employment %	0.09	-0.08	0.22	-0.26	-0.10	0.28	1.00	-0.29	-0.13	-0.20
Full-time employment %	0.04	0.12	-0.36	0.21	0.30	-0.33	-0.29	1.00	-0.03	0.90
Self-employment %	-0.24	0.28	-0.49	-0.44	0.64	0.34	-0.13	-0.03	1.00	0.38
Total employment %	-0.06	0.22	-0.52	-0.02	0.55	-0.14	-0.20	0.90	0.38	1.00

3.2 Submarket 2: Crowded House

The most significant variables that explain the variation in house prices in the Crowded House submarket are (in order of significance):

1. Ethnic group: white
2. Households living in flats/maisonettes
3. Households in socially rented accommodation
4. Number of British Rail and London Underground stations within a radius of 1.5km
5. Overcrowded households.

Table 7. Model summary

R	R Square	Adjusted R Square	Standard error of the estimate
0.79	0.62	0.61	0.19

In this submarket, 62 per cent of the variation in house prices is explained by the five variables above.

Table 8. Analysis of variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	9.54	5	1.91	54.34	0.00
Residual	5.90	168	0.04		
Total	15.43	173			

The regression sum of squares (RSS) of 9.5 is nearly twice as large as the residual sum of squares (RSS) of 5.9, indicating that the Crowded House submarket accounts for most of the variation in average house prices (dependent variable). The null hypothesis that home sale price is not linearly related to all the explanatory variables can be rejected, as the F statistic is significant.

Table 9. Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig	95% Confidence Interval for B		Correlations			Collinearity statistics	
	B	Standard error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	10.97	0.17		63.35	0.00	10.63	11.31					
Ethnicity white	0.01	0.00	0.49	6.72	0.00	0.01	0.02	0.65	0.46	0.32	0.44	2.30
Households: Flats/maisonettes	0.01	0.00	0.31	3.98	0.00	0.00	0.01	0.59	0.29	0.19	0.37	2.74
Households: social rented	-0.01	0.00	-0.23	-3.96	0.00	-0.01	0.00	-0.15	-0.29	-0.19	0.69	1.44
British Rail and London Underground less than 1.5km	0.01	0.00	0.15	2.39	0.02	0.00	0.02	0.52	0.18	0.11	0.59	1.69
Overcrowded households	0.01	0.00	0.17	2.35	0.02	0.00	0.02	0.05	0.18	0.11	0.45	2.23

The t statistics are all significant at the 95 per cent confidence level in Table 9. The collinearity statistics show that there is some multicollinearity but it is not severe. In Table 10 the proportion of households in socially rented accommodation is positively correlated with overcrowding

Table 10. Correlations

		Log of house prices	Ethnic group: white	Households: Flats/maisonettes	Households: social rented	British Rail and London Underground less than 1.5km	Overcrowded households
Pearson Correlation	Log of house prices	1.00	0.65	0.59	-0.15	0.52	0.05
	Ethnicity white	0.65	1.00	0.39	-0.26	0.32	-0.39
	Households: Flats/maisonettes	0.59	0.39	1.00	0.33	0.61	0.42
	Households: social rented	-0.15	-0.26	0.33	1.00	0.12	0.47
	British Rail and London Underground less than 1.5km	0.52	0.32	0.61	0.12	1.00	0.30
	Overcrowded households	0.05	-0.39	0.42	0.47	0.30	1.00
Sig. (1-tailed)	Log of house prices	.	0.00	0.00	0.02	0.00	0.26
	Ethnicity white	0.00	.	0.00	0.00	0.00	0.00
	Households: Flats/maisonettes	0.00	0.00	.	0.00	0.00	0.00
	Households: social rented	0.02	0.00	0.00	.	0.05	0.00
	British Rail and London Underground less than 1.5km	0.00	0.00	0.00	0.05	.	0.00
	Overcrowded households	0.26	0.00	0.00	0.00	0.00	.

All variables are significantly correlated with each other, except for house prices and overcrowded households.

Table 11. Overall Correlations

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
House price	1.00	0.45	-0.35	-0.17	-0.58	0.65	0.46	-0.50	-0.49
Private rented %	0.45	1.00	-0.16	-0.23	-0.16	0.34	0.53	-0.18	-0.23
Average rooms per household	-0.35	-0.16	1.00	-0.09	0.63	-0.22	-0.02	0.58	0.63
Income Support claimants %	-0.17	-0.23	-0.09	1.00	0.10	-0.11	-0.45	0.16	0.07
Public transport travel time (mins)	-0.58	-0.16	0.63	0.10	1.00	-0.35	-0.22	0.63	0.70
Ethnic group: white %	0.65	0.34	-0.22	-0.11	-0.35	1.00	0.57	-0.46	-0.39
Economically active %	0.46	0.53	-0.02	-0.45	-0.22	0.57	1.00	-0.31	-0.24
Households: detached %	-0.50	-0.18	0.58	0.16	0.63	-0.46	-0.31	1.00	0.86
Households: semi-detached %	-0.49	-0.23	0.63	0.07	0.70	-0.39	-0.24	0.86	1.00
Households: terraced %	-0.58	-0.23	0.78	0.04	0.74	-0.34	-0.21	0.72	0.74
Households: flats /maisonettes %	0.59	0.23	-0.78	-0.06	-0.77	0.39	0.24	-0.82	-0.86
Households: owner-occupied %	-0.09	0.26	0.63	-0.16	0.50	0.12	0.30	0.34	0.44
Households: social rented %	-0.15	-0.68	-0.40	0.24	-0.31	-0.26	-0.49	-0.18	-0.22
Average household size	-0.61	-0.44	0.50	0.09	0.47	-0.79	-0.67	0.53	0.49
Overcrowded households %	0.05	-0.07	-0.59	0.17	-0.31	-0.39	-0.47	-0.23	-0.28
One-person households %	0.59	0.38	-0.68	0.04	-0.56	0.61	0.35	-0.59	-0.62
Couples with dependent children %	-0.59	-0.51	0.46	0.10	0.49	-0.74	-0.67	0.54	0.52
Green spaces less than 1.5km	-0.04	-0.02	-0.03	-0.06	0.02	0.06	-0.18	-0.06	-0.07
British Rail and London Underground less than 1.5km	0.52	0.35	-0.61	-0.07	-0.63	0.32	0.11	-0.41	-0.49
Schools less than 2km	0.12	0.04	-0.11	0.00	-0.20	-0.10	-0.11	-0.25	-0.34
Average KS3 scores	0.32	0.22	-0.19	-0.14	-0.27	0.15	0.13	-0.13	-0.08
People aged 0-19 years %	-0.69	-0.65	0.41	0.25	0.53	-0.74	-0.73	0.56	0.53
People aged 20-29 years %	0.32	0.70	-0.33	-0.26	-0.33	0.24	0.43	-0.40	-0.44
People aged 30-64 years %	0.47	0.27	-0.06	-0.10	-0.16	0.52	0.65	-0.14	-0.09
People aged 65 years and above %	0.09	-0.37	-0.14	0.12	-0.21	0.28	-0.26	-0.18	-0.12
Part-time employment %	-0.56	-0.68	0.42	0.08	0.39	-0.46	-0.42	0.39	0.39

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
Full-time employment %	0.42	0.55	-0.07	-0.42	-0.20	0.57	0.93	-0.29	-0.23
Self-employment %	0.74	0.43	-0.12	-0.18	-0.37	0.70	0.63	-0.41	-0.36
Total employment %	0.55	0.52	-0.04	-0.42	-0.25	0.68	0.97	-0.34	-0.27

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
House price	-0.58	0.59	-0.09	-0.15	-0.61	0.05	0.59	-0.59	-0.04	0.52
Private rented %	-0.23	0.23	0.26	-0.68	-0.44	-0.07	0.38	-0.51	-0.02	0.35
Average rooms per household	0.78	-0.78	0.63	-0.40	0.50	-0.59	-0.68	0.46	-0.03	-0.61
Income Support claimants %	0.04	-0.06	-0.16	0.24	0.09	0.17	0.04	0.10	-0.06	-0.07
Public transport travel time (mins)	0.74	-0.77	0.50	-0.31	0.47	-0.31	-0.56	0.49	0.02	-0.63
Ethnic group: white %	-0.34	0.39	0.12	-0.26	-0.79	-0.39	0.61	-0.74	0.06	0.32
Economically active %	-0.21	0.24	0.30	-0.49	-0.67	-0.47	0.35	-0.67	-0.18	0.11
Households: detached %	0.72	-0.82	0.34	-0.18	0.53	-0.23	-0.59	0.54	-0.06	-0.41
Households: semi-detached %	0.74	-0.86	0.44	-0.22	0.49	-0.28	-0.62	0.52	-0.07	-0.49
Households: terraced %	1.00	-0.98	0.61	-0.35	0.50	-0.45	-0.62	0.49	0.02	-0.62
Households: flats/maisonettes %	-0.98	1.00	-0.59	0.33	-0.53	0.42	0.66	-0.54	0.00	0.61
Households: owner-occupied %	0.61	-0.59	1.00	-0.88	0.05	-0.57	-0.26	0.10	-0.10	-0.38
Households: social rented %	-0.35	0.33	-0.88	1.00	0.18	0.47	0.02	0.17	0.09	0.12
Average household size	0.50	-0.53	0.05	0.18	1.00	0.22	-0.83	0.93	0.06	-0.41
Overcrowded households %	-0.45	0.42	-0.57	0.47	0.22	1.00	0.12	0.23	0.10	0.30
One-person households %	-0.62	0.66	-0.26	0.02	-0.83	0.12	1.00	-0.73	0.02	0.52
Couples with dependent children %	0.49	-0.54	0.10	0.17	0.93	0.23	-0.73	1.00	0.07	-0.43
Green spaces less than 1.5km	0.02	0.00	-0.10	0.09	0.06	0.10	0.02	0.07	1.00	0.00
British Rail and London Underground less than 1.5km	-0.62	0.61	-0.38	0.12	-0.41	0.30	0.52	-0.43	0.00	1.00
Schools less than 2km	-0.22	0.27	-0.04	0.01	0.17	0.31	0.04	0.12	-0.03	0.03
Average KS3 scores	-0.18	0.16	0.07	-0.16	-0.22	0.18	0.22	-0.16	0.09	0.27

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
People aged 0-19 years %	0.53	-0.56	-0.07	0.37	0.85	0.20	-0.68	0.88	0.08	-0.47
People aged 20-29 years %	-0.39	0.43	-0.05	-0.30	-0.32	0.05	0.29	-0.51	-0.05	0.41
People aged 30-64 years %	-0.15	0.14	0.27	-0.34	-0.67	-0.31	0.43	-0.52	-0.10	0.03
People aged 65 years and above %	-0.12	0.14	-0.16	0.30	-0.15	-0.04	0.20	-0.08	0.09	0.15
Part-time employment %	0.44	-0.44	-0.02	0.34	0.57	-0.04	-0.55	0.67	0.07	-0.44
Full-time employment %	-0.19	0.22	0.32	-0.51	-0.65	-0.50	0.32	-0.69	-0.19	0.14
Self-employment %	-0.39	0.41	0.20	-0.36	-0.65	-0.15	0.56	-0.54	-0.06	0.29
Total employment %	-0.24	0.27	0.35	-0.52	-0.71	-0.49	0.40	-0.69	-0.18	0.16

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
House price	0.12	0.32	-0.69	0.32	0.47	0.09	-0.56	0.42	0.74	0.55
Private rented %	0.04	0.22	-0.65	0.70	0.27	-0.37	-0.68	0.55	0.43	0.52
Average rooms per household	-0.11	-0.19	0.41	-0.33	-0.06	-0.14	0.42	-0.07	-0.12	-0.04
Income Support claimants %	0.00	-0.14	0.25	-0.26	-0.10	0.12	0.08	-0.42	-0.18	-0.42
Public transport travel time (mins)	-0.20	-0.27	0.53	-0.33	-0.16	-0.21	0.39	-0.20	-0.37	-0.25
Ethnic group: white %	-0.10	0.15	-0.74	0.24	0.52	0.28	-0.46	0.57	0.70	0.68
Economically active %	-0.11	0.13	-0.73	0.43	0.65	-0.26	-0.42	0.93	0.63	0.97
Households: detached %	-0.25	-0.13	0.56	-0.40	-0.14	-0.18	0.39	-0.29	-0.41	-0.34
Households: semi-detached %	-0.34	-0.08	0.53	-0.44	-0.09	-0.12	0.39	-0.23	-0.36	-0.27
Households: terraced %	-0.22	-0.18	0.53	-0.39	-0.15	-0.12	0.44	-0.19	-0.39	-0.24
Households: flats/maisonettes %	0.27	0.16	-0.56	0.43	0.14	0.14	-0.44	0.22	0.41	0.27
Households: owner-occupied %	-0.04	0.07	-0.07	-0.05	0.27	-0.16	-0.02	0.32	0.20	0.35
Households: social rented %	0.01	-0.16	0.37	-0.30	-0.34	0.30	0.34	-0.51	-0.36	-0.52
Average household size	0.17	-0.22	0.85	-0.32	-0.67	-0.15	0.57	-0.65	-0.65	-0.71
Overcrowded households %	0.31	0.18	0.20	0.05	-0.31	-0.04	-0.04	-0.50	-0.15	-0.49
One-person households %	0.04	0.22	-0.68	0.29	0.43	0.20	-0.55	0.32	0.56	0.40

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
Couples with dependent children %	0.12	-0.16	0.88	-0.51	-0.52	-0.08	0.67	-0.69	-0.54	-0.69
Green spaces less than 1.5km	-0.03	0.09	0.08	-0.05	-0.10	0.09	0.07	-0.19	-0.06	-0.18
British Rail and London Underground less than 1.5km	0.03	0.27	-0.47	0.41	0.03	0.15	-0.44	0.14	0.29	0.16
Schools less than 2km	1.00	0.09	-0.06	0.11	-0.13	0.10	-0.05	-0.11	0.09	-0.07
Average KS3 scores	0.09	1.00	-0.27	0.04	0.25	0.12	-0.16	0.08	0.30	0.16
People aged 0-19 years %	-0.06	-0.27	1.00	-0.63	-0.54	-0.07	0.72	-0.76	-0.64	-0.78
People aged 20-29 years %	0.11	0.04	-0.63	1.00	-0.14	-0.39	-0.70	0.52	0.16	0.39
People aged 30-64 years %	-0.13	0.25	-0.54	-0.14	1.00	-0.11	-0.23	0.53	0.68	0.68
People aged 65 years and above %	0.10	0.12	-0.07	-0.39	-0.11	1.00	0.17	-0.20	0.00	-0.15
Part-time employment %	-0.05	-0.16	0.72	-0.70	-0.23	0.17	1.00	-0.54	-0.42	-0.46
Full-time employment %	-0.11	0.08	-0.76	0.52	0.53	-0.20	-0.54	1.00	0.45	0.94
Self-employment %	0.09	0.30	-0.64	0.16	0.68	0.00	-0.42	0.45	1.00	0.69
Total employment %	-0.07	0.16	-0.78	0.39	0.68	-0.15	-0.46	0.94	0.69	1.00

3.3 Submarket 3: Pleasant Crescent

The five most significant variables that explain the variation in house prices in the Pleasant Crescent submarket are (in order of significance):

1. Ethnic group: white
2. Household composition: couples with dependent children
3. Households living in flats/maisonettes
4. Number of British Rail and London Underground stations within a radius of 1.5km
5. Average Key Stage 3 point score in 2002 for schools within a radius of 2km.

Table 12. Model summary

R	R Square	Adjusted R Square	Standard error of the estimate
0.79	0.63	0.62	0.25

In Pleasant Crescent, 63 per cent of the variation in house prices is explained by the five most significant variables.

Table 13. Analysis of variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	17.54	5	3.51	56.18	0.00
Residual	10.30	165	0.06		
Total	27.84	170			

The null hypothesis that home sale price is not linearly related to all the explanatory variables can be rejected, as the F statistic is significant.

Table 14. Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig	95% Confidence Interval for B		Correlations			Collinearity statistics	
	B	Standard error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	9.12	0.29		31.01	0.00	8.54	9.70					
Ethnic group: white	0.02	0.00	0.69	10.90	0.00	0.02	0.02	0.66	0.65	0.52	0.56	1.79
Households: Flats/maisonettes	0.01	0.00	0.30	4.06	0.00	0.00	0.01	0.49	0.30	0.19	0.40	2.49
Couples with dependent children	0.03	0.01	0.42	5.34	0.00	0.02	0.04	-0.29	0.38	0.25	0.37	2.74
Average KS3 scores	0.02	0.01	0.15	3.08	0.00	0.01	0.04	0.31	0.23	0.15	0.92	1.09
British Rail and London Underground less than 1.5km	0.03	0.01	0.25	4.80	0.00	0.02	0.05	0.41	0.35	0.23	0.85	1.18

The t statistics are all highly significant and have the expected signs. There is slight multicollinearity with a high variance inflation factor (VIF) for households in flats/maisonettes and couples with dependent children households. The small tolerance for households in flats/maisonettes (0.4) shows that around 60 per cent of the variance in this predictor can be explained by other predictors. On the other hand the large tolerance for Average KS3 scores (0.92) indicates that other predictors can explain only 8 per cent of its variance.

Table 15. Correlations

		Log of house prices	Ethnic group: white	Households: Flats/maisonettes	Couple with dependent children	Average KS3 scores	British Rail and London Underground less than 1.5km
Pearson Correlation	Log of house prices	1.00	0.66	0.49	-0.29	0.31	0.41
	Ethnic group: white	0.66	1.00	0.56	-0.64	0.11	0.19
	Households: Flats/maisonettes	0.49	0.56	1.00	-0.73	0.10	0.38
	Couples with dependent children	-0.29	-0.64	-0.73	1.00	0.06	-0.23
	Average KS3 scores	0.31	0.11	0.10	0.06	1.00	0.11
	British Rail and London Underground less than 1.5km	0.41	0.19	0.38	-0.23	0.11	1.00
Sig. (1-tailed)	Log of house prices	.	0.00	0.00	0.00	0.00	0.00
	Ethnic group: white	0.00	.	0.00	0.00	0.07	0.01
	Households: Flats/maisonettes	0.00	0.00	.	0.00	0.11	0.00
	Couples with dependent children	0.00	0.00	0.00	.	0.21	0.00
	Average KS3 scores	0.00	0.07	0.11	0.21	.	0.07
	British Rail and London Underground less than 1.5km	0.00	0.01	0.00	0.00	0.07	.

In this submarket, all correlations are significant with the exception of Average KS3 scores and couples with dependents households.

Table 16. Overall Correlations

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
House price	1.00	0.40	0.30	-0.50	-0.57	0.66	0.23	0.08	-0.24
Private rented %	0.40	1.00	0.00	-0.42	-0.24	0.29	0.26	0.11	-0.13
Average rooms per household	0.30	0.00	1.00	-0.31	0.04	0.11	-0.14	0.67	0.48
Income Support claimants %	-0.50	-0.42	-0.31	1.00	0.05	-0.55	-0.47	-0.18	-0.04
Public transport travel time (mins)	-0.57	-0.24	0.04	0.05	1.00	-0.27	-0.11	0.20	0.46
Ethnic group: white %	0.66	0.29	0.11	-0.55	-0.27	1.00	0.62	-0.01	-0.29
Economically active %	0.23	0.26	-0.14	-0.47	-0.11	0.62	1.00	-0.19	-0.21
Households: detached %	0.08	0.11	0.67	-0.18	0.20	-0.01	-0.19	1.00	0.47
Households: semi-detached %	-0.24	-0.13	0.48	-0.04	0.46	-0.29	-0.21	0.47	1.00
Households: terraced %	-0.43	-0.45	0.01	0.31	0.15	-0.46	-0.34	-0.27	-0.12
Households: flats /maisonettes %	0.49	0.43	-0.43	-0.21	-0.43	0.56	0.46	-0.27	-0.55
Households: owner-occupied %	0.04	-0.03	0.58	-0.49	0.23	0.00	0.08	0.38	0.48
Households: social rented %	-0.26	-0.53	-0.50	0.65	-0.06	-0.16	-0.21	-0.38	-0.33
Average household size	-0.37	-0.28	0.40	0.38	0.20	-0.71	-0.67	0.28	0.49
Overcrowded households %	-0.10	0.08	-0.46	0.43	-0.15	-0.48	-0.50	-0.18	-0.13
One-person households %	0.39	0.35	-0.43	-0.29	-0.22	0.58	0.36	-0.23	-0.52
Couples with dependent children %	-0.29	-0.27	0.49	0.25	0.28	-0.64	-0.69	0.33	0.50
Green spaces less than 1.5km	0.10	-0.01	0.27	-0.17	0.12	0.16	0.03	0.12	0.03
British Rail and London Underground less than 1.5km	0.41	0.21	-0.15	0.01	-0.51	0.19	0.04	-0.18	-0.31
Schools less than 2km	0.60	0.18	0.09	-0.17	-0.49	0.34	-0.03	-0.03	-0.23
Average KS3 scores	0.31	0.33	0.17	-0.28	-0.01	0.11	-0.12	0.16	0.17
People aged 0-19 years %	-0.49	-0.44	0.24	0.53	0.29	-0.70	-0.74	0.16	0.33
People aged 20-29 years %	0.02	0.41	-0.39	-0.13	-0.23	0.21	0.52	-0.22	-0.24
People aged 30-64 years %	0.48	0.03	-0.02	-0.27	-0.27	0.41	0.44	-0.26	-0.29
People aged 65 years and above %	0.19	0.07	0.21	-0.35	0.18	0.34	-0.09	0.37	0.15
Part-time employment %	-0.62	-0.47	0.17	0.44	0.39	-0.48	-0.41	0.16	0.37

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
Full-time employment %	0.08	0.25	-0.29	-0.41	0.01	0.50	0.91	-0.27	-0.21
Self-employment %	0.85	0.36	0.42	-0.55	-0.43	0.67	0.30	0.25	-0.10
Total employment %	0.39	0.33	-0.03	-0.60	-0.13	0.73	0.97	-0.11	-0.18

	Households: terraced %	Households: flats/maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
House price	-0.43	0.49	0.04	-0.26	-0.37	-0.10	0.39	-0.29	0.10	0.41
Private rented %	-0.45	0.43	-0.03	-0.53	-0.28	0.08	0.35	-0.27	-0.01	0.21
Average rooms per household	0.01	-0.43	0.58	-0.50	0.40	-0.46	-0.43	0.49	0.27	-0.15
Income Support claimants %	0.31	-0.21	-0.49	0.65	0.38	0.43	-0.29	0.25	-0.17	0.01
Public transport travel time (mins)	0.15	-0.43	0.23	-0.06	0.20	-0.15	-0.22	0.28	0.12	-0.51
Ethnic group: white %	-0.46	0.56	0.00	-0.16	-0.71	-0.48	0.58	-0.64	0.16	0.19
Economically active %	-0.34	0.46	0.08	-0.21	-0.67	-0.50	0.36	-0.69	0.03	0.04
Households: detached %	-0.27	-0.27	0.38	-0.38	0.28	-0.18	-0.23	0.33	0.12	-0.18
Households: semi-detached %	-0.12	-0.55	0.48	-0.33	0.49	-0.13	-0.52	0.50	0.03	-0.31
Households: terraced %	1.00	-0.73	0.13	0.14	0.45	0.00	-0.45	0.43	0.09	-0.18
Households: flats/maisonettes %	-0.73	1.00	-0.47	0.16	-0.73	0.12	0.73	-0.73	-0.12	0.38
Households: owner-occupied %	0.13	-0.47	1.00	-0.83	0.19	-0.44	-0.23	0.31	0.17	-0.27
Households: social rented %	0.14	0.16	-0.83	1.00	-0.01	0.32	0.00	-0.11	-0.14	0.11
Average household size	0.45	-0.73	0.19	-0.01	1.00	0.28	-0.88	0.93	0.02	-0.21
Overcrowded households %	0.00	0.12	-0.44	0.32	0.28	1.00	-0.03	0.20	-0.22	0.21
One-person households %	-0.45	0.73	-0.23	0.00	-0.88	-0.03	1.00	-0.76	-0.05	0.21
Couples with dependent children %	0.43	-0.73	0.31	-0.11	0.93	0.20	-0.76	1.00	0.10	-0.23
Green spaces less than 1.5km	0.09	-0.12	0.17	-0.14	0.02	-0.22	-0.05	0.10	1.00	-0.11
British Rail and London Underground less than 1.5km	-0.18	0.38	-0.27	0.11	-0.21	0.21	0.21	-0.23	-0.11	1.00
Schools less than 2km	-0.24	0.35	0.00	-0.10	-0.18	0.19	0.30	-0.12	-0.02	0.42
Average KS3 scores	-0.26	0.10	0.13	-0.30	-0.02	0.11	0.13	0.06	-0.03	0.11

	Households: terraced %	Households: flats/maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
People aged 0-19 years %	0.50	-0.65	0.01	0.23	0.85	0.28	-0.67	0.87	0.01	-0.21
People aged 20-29 years %	-0.22	0.38	-0.32	0.05	-0.29	-0.01	0.11	-0.52	-0.22	0.12
People aged 30-64 years %	-0.17	0.36	0.15	-0.15	-0.55	-0.18	0.44	-0.41	0.13	0.23
People aged 65 years and above %	-0.28	0.07	0.27	-0.27	-0.30	-0.23	0.40	-0.16	0.15	-0.12
Part-time employment %	0.39	-0.58	0.11	0.17	0.58	0.02	-0.50	0.60	0.12	-0.30
Full-time employment %	-0.23	0.38	0.01	-0.15	-0.63	-0.45	0.32	-0.67	-0.08	-0.02
Self-employment %	-0.52	0.44	0.24	-0.40	-0.38	-0.22	0.40	-0.25	0.23	0.28
Total employment %	-0.41	0.48	0.15	-0.31	-0.70	-0.55	0.42	-0.67	0.06	0.06

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
House price	0.60	0.31	-0.49	0.02	0.48	0.19	-0.62	0.08	0.85	0.39
Private rented %	0.18	0.33	-0.44	0.41	0.03	0.07	-0.47	0.25	0.36	0.33
Average rooms per household	0.09	0.17	0.24	-0.39	-0.02	0.21	0.17	-0.29	0.42	-0.03
Income Support claimants %	-0.17	-0.28	0.53	-0.13	-0.27	-0.35	0.44	-0.41	-0.55	-0.60
Public transport travel time (mins)	-0.49	-0.01	0.29	-0.23	-0.27	0.18	0.39	0.01	-0.43	-0.13
Ethnic group: white %	0.34	0.11	-0.70	0.21	0.41	0.34	-0.48	0.50	0.67	0.73
Economically active %	-0.03	-0.12	-0.74	0.52	0.44	-0.09	-0.41	0.91	0.30	0.97
Households: detached %	-0.03	0.16	0.16	-0.22	-0.26	0.37	0.16	-0.27	0.25	-0.11
Households: semi-detached %	-0.23	0.17	0.33	-0.24	-0.29	0.15	0.37	-0.21	-0.10	-0.18
Households: terraced %	-0.24	-0.26	0.50	-0.22	-0.17	-0.28	0.39	-0.23	-0.52	-0.41
Households: flats/maisonettes %	0.35	0.10	-0.65	0.38	0.36	0.07	-0.58	0.38	0.44	0.48
Households: owner-occupied %	0.00	0.13	0.01	-0.32	0.15	0.27	0.11	0.01	0.24	0.15
Households: social rented %	-0.10	-0.30	0.23	0.05	-0.15	-0.27	0.17	-0.15	-0.40	-0.31
Average household size	-0.18	-0.02	0.85	-0.29	-0.55	-0.30	0.58	-0.63	-0.38	-0.70
Overcrowded households %	0.19	0.11	0.28	-0.01	-0.18	-0.23	0.02	-0.45	-0.22	-0.55
One-person households %	0.30	0.13	-0.67	0.11	0.44	0.40	-0.50	0.32	0.40	0.42
Couples with dependent children %	-0.12	0.06	0.87	-0.52	-0.41	-0.16	0.60	-0.67	-0.25	-0.67

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
Green spaces less than 1.5km	-0.02	-0.03	0.01	-0.22	0.13	0.15	0.12	-0.08	0.23	0.06
British Rail and London Underground less than 1.5km	0.42	0.11	-0.21	0.12	0.23	-0.12	-0.30	-0.02	0.28	0.06
Schools less than 2km	1.00	0.29	-0.18	-0.11	0.30	0.10	-0.29	-0.16	0.52	0.05
Average KS3 scores	0.29	1.00	-0.11	-0.09	0.04	0.26	-0.18	-0.14	0.32	-0.02
People aged 0-19 years %	-0.18	-0.11	1.00	-0.54	-0.44	-0.31	0.74	-0.73	-0.44	-0.79
People aged 20-29 years %	-0.11	-0.09	-0.54	1.00	-0.27	-0.28	-0.50	0.66	-0.19	0.46
People aged 30-64 years %	0.30	0.04	-0.44	-0.27	1.00	-0.07	-0.30	0.23	0.58	0.46
People aged 65 years and above %	0.10	0.26	-0.31	-0.28	-0.07	1.00	-0.12	-0.08	0.31	0.06
Part-time employment %	-0.29	-0.18	0.74	-0.50	-0.30	-0.12	1.00	-0.50	-0.39	-0.49
Full-time employment %	-0.16	-0.14	-0.73	0.66	0.23	-0.08	-0.50	1.00	0.01	0.89
Self-employment %	0.52	0.32	-0.44	-0.19	0.58	0.31	-0.39	0.01	1.00	0.44
Total employment %	0.05	-0.02	-0.79	0.46	0.46	0.06	-0.49	0.89	0.44	1.00

3.4 Submarket 4: Suburban London

The five most significant variables that explain the variation in house prices in the Suburban London submarket are (in order of significance):

1. Households in owner occupied dwellings
2. Households in socially rented accommodation
3. The proportion of self employed people
4. One-person households
5. Households living in terraced properties.

Table 17. Model summary

R	R Square	Adjusted R Square	Standard error of the estimate
0.85	0.72	0.72	0.16

A high R value indicates a strong correlation between the observed and predicted values of the dependent variable. The variables provide a good fit to the model with 72 per cent of the variation in house prices explained by the five variables above.

Table 18. Analysis of variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	15.66	5	3.13	130.05	0.00
Residual	5.95	247	0.02		
Total	21.60	252			

The RSS of 15.66 is nearly three times as large as the residual sum of squares, indicating that the submarket accounts for most of the variation in average house prices. The F statistic is highly significant at 5 degrees of freedom.

Table 19. Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig	95% Confidence Interval for B		Correlations			Collinearity statistics	
	B	Standard error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	13.47	0.21		65.66	0.00	13.06	13.87					
Households: owner-occupied	-0.02	0.00	-0.68	-10.05	0.00	-0.03	-0.02	0.04	-0.54	-0.34	0.25	4.05
Self employed people	0.07	0.01	0.60	13.63	0.00	0.06	0.08	0.77	0.66	0.46	0.57	1.77
Households: terraced	0.00	0.00	-0.09	-2.42	0.02	0.00	0.00	-0.48	-0.15	-0.08	0.74	1.36
Households: socially rented	-0.02	0.00	-0.64	-9.09	0.00	-0.02	-0.01	-0.41	-0.50	-0.30	0.22	4.48
One-person households	-0.01	0.00	-0.10	-2.63	0.01	-0.01	0.00	0.20	-0.16	-0.09	0.74	1.36

The t statistics are all significant at the 95 per cent confidence interval. There is some multicollinearity with VIF values for households in owner occupied dwellings and households in socially rented accommodation. However, since $R \leq 0.9$ it is not a serious multicollinearity problem.

Table 20. Correlations

		Log of house prices	Households: owner-occupied	Self employed people	Households: terraced	Households: socially rented	One-person households
Pearson Correlation	Log of house prices	1.00	0.04	0.77	-0.48	-0.41	0.20
	Households: owner-occupied	0.04	1.00	0.25	0.02	-0.83	-0.37
	Self employed people	0.77	0.25	1.00	-0.46	-0.49	0.24
	Households: terraced	-0.48	0.02	-0.46	1.00	0.20	-0.26
	Households: socially rented	-0.41	-0.83	-0.49	0.20	1.00	0.18
	One-person households	0.20	-0.37	0.24	-0.26	0.18	1.00
Sig. (1-tailed)	Log of house prices	.	0.25	0.00	0.00	0.00	0.00
	Households: owner-occupied	0.25	.	0.00	0.36	0.00	0.00
	Self employed people	0.00	0.00	.	0.00	0.00	0.00
	Households: terraced	0.00	0.36	0.00	.	0.00	0.00
	Households: socially rented	0.00	0.00	0.00	0.00	.	0.00
	One-person households	0.00	0.00	0.00	0.00	0.00	.

The only correlations that are not significant are between households in owner occupied dwellings and households in terraced properties, and between households in owner occupied dwellings and house prices.

Table 21. Overall Correlations

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
House price	1.00	0.66	0.53	-0.52	-0.45	0.03	0.35	0.35	-0.05
Private rented %	0.66	1.00	0.17	-0.50	-0.40	-0.19	0.42	0.17	-0.23
Average rooms per household	0.53	0.17	1.00	-0.26	-0.43	0.03	0.06	0.44	0.16
Income Support claimants %	-0.52	-0.50	-0.26	1.00	0.14	-0.20	-0.63	-0.12	-0.08
Public transport travel time (mins)	-0.45	-0.40	-0.43	0.14	1.00	0.20	-0.07	0.02	0.21
Ethnic group: white %	0.03	-0.19	0.03	-0.20	0.20	1.00	0.32	0.17	-0.25
Economically active %	0.35	0.42	0.06	-0.63	-0.07	0.32	1.00	-0.02	-0.12
Households: detached %	0.35	0.17	0.44	-0.12	0.02	0.17	-0.02	1.00	-0.01
Households: semi-detached %	-0.05	-0.23	0.16	-0.08	0.21	-0.25	-0.12	-0.01	1.00
Households: terraced %	-0.48	-0.38	-0.20	0.31	0.04	-0.03	-0.17	-0.54	-0.38
Households: flats /maisonettes %	0.45	0.58	-0.10	-0.23	-0.27	0.20	0.32	0.17	-0.50
Households: owner-occupied %	0.04	-0.16	0.46	-0.34	0.01	-0.08	0.19	0.12	0.43
Households: social rented %	-0.41	-0.42	-0.52	0.60	0.22	0.18	-0.42	-0.21	-0.27
Average household size	-0.19	-0.15	0.15	0.32	-0.02	-0.76	-0.51	-0.19	0.42
Overcrowded households %	-0.04	0.24	-0.38	0.32	-0.05	-0.76	-0.33	-0.13	0.00
One-person households %	0.20	0.27	-0.25	-0.24	-0.04	0.57	0.39	0.16	-0.51
Couples with dependent children %	-0.17	-0.17	0.20	0.21	-0.03	-0.70	-0.38	-0.19	0.43
Green spaces less than 1.5km	0.24	0.15	0.08	-0.16	-0.01	0.10	0.22	0.05	-0.08
British Rail and London Underground less than 1.5km	0.40	0.41	0.22	-0.20	-0.52	-0.15	0.24	-0.04	-0.05
Schools less than 2km	0.33	0.26	0.26	-0.11	-0.46	0.01	0.14	0.07	-0.26
Average KS3 scores	0.24	0.16	0.24	-0.20	-0.29	-0.03	0.06	0.02	0.07
People aged 0-19 years %	-0.60	-0.48	-0.19	0.54	0.19	-0.39	-0.55	-0.34	0.15
People aged 20-29 years %	0.29	0.58	-0.18	-0.24	-0.16	-0.19	0.28	0.02	-0.22
People aged 30-64 years %	0.41	0.29	0.25	-0.40	-0.16	0.19	0.62	-0.03	-0.04
People aged 65 years and above %	0.07	-0.23	0.17	-0.06	0.07	0.46	-0.15	0.40	0.07
Part-time employment %	-0.50	-0.69	0.00	0.14	0.31	0.33	-0.12	-0.12	0.27

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
Full-time employment %	0.13	0.35	-0.26	-0.48	0.12	0.23	0.86	-0.17	-0.14
Self-employment %	0.77	0.45	0.67	-0.47	-0.44	0.23	0.39	0.46	-0.03
Total employment %	0.38	0.36	0.11	-0.65	-0.03	0.43	0.96	0.05	-0.07

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
House price	-0.48	0.45	0.04	-0.41	-0.19	-0.04	0.20	-0.17	0.24	0.40
Private rented %	-0.38	0.58	-0.16	-0.42	-0.15	0.24	0.27	-0.17	0.15	0.41
Average rooms per household	-0.20	-0.10	0.46	-0.52	0.15	-0.38	-0.25	0.20	0.08	0.22
Income Support claimants %	0.31	-0.23	-0.34	0.60	0.32	0.32	-0.24	0.21	-0.16	-0.20
Public transport travel time (mins)	0.04	-0.27	0.01	0.22	-0.02	-0.05	-0.04	-0.03	-0.01	-0.52
Ethnic group: white %	-0.03	0.20	-0.08	0.18	-0.76	-0.76	0.57	-0.70	0.10	-0.15
Economically active %	-0.17	0.32	0.19	-0.42	-0.51	-0.33	0.39	-0.38	0.22	0.24
Households: detached %	-0.54	0.17	0.12	-0.21	-0.19	-0.13	0.16	-0.19	0.05	-0.04
Households: semi-detached %	-0.38	-0.50	0.43	-0.27	0.42	0.00	-0.51	0.43	-0.08	-0.05
Households: terraced %	1.00	-0.52	0.02	0.20	0.23	-0.07	-0.26	0.25	-0.14	-0.20
Households: flats/maisonettes %	-0.52	1.00	-0.49	0.12	-0.56	0.13	0.70	-0.60	0.22	0.31
Households: owner-occupied %	0.02	-0.49	1.00	-0.83	0.18	-0.36	-0.37	0.36	0.01	-0.03
Households: social rented %	0.20	0.12	-0.83	1.00	-0.09	0.20	0.18	-0.24	-0.09	-0.21
Average household size	0.23	-0.56	0.18	-0.09	1.00	0.54	-0.90	0.93	-0.14	-0.05
Overcrowded households %	-0.07	0.13	-0.36	0.20	0.54	1.00	-0.24	0.41	-0.03	0.08
One-person households %	-0.26	0.70	-0.37	0.18	-0.90	-0.24	1.00	-0.89	0.15	0.07
Couples with dependent children %	0.25	-0.60	0.36	-0.24	0.93	0.41	-0.89	1.00	-0.14	-0.05
Green spaces less than 1.5km	-0.14	0.22	0.01	-0.09	-0.14	-0.03	0.15	-0.14	1.00	-0.01
British Rail and London Underground less than 1.5km	-0.20	0.31	-0.03	-0.21	-0.05	0.08	0.07	-0.05	-0.01	1.00
Schools less than 2km	-0.07	0.30	-0.03	-0.12	-0.13	-0.03	0.15	-0.09	0.07	0.20
Average KS3 scores	-0.15	0.11	0.08	-0.16	0.04	-0.01	-0.02	0.08	0.01	0.19

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
People aged 0-19 years %	0.48	-0.53	-0.14	0.40	0.69	0.31	-0.64	0.65	-0.19	-0.30
People aged 20-29 years %	-0.20	0.43	-0.20	-0.15	-0.09	0.34	0.20	-0.18	-0.03	0.17
People aged 30-64 years %	-0.13	0.20	0.28	-0.42	-0.34	-0.32	0.19	-0.19	0.30	0.36
People aged 65 years and above %	-0.26	0.05	0.11	0.03	-0.43	-0.41	0.40	-0.43	0.00	-0.12
Part-time employment %	0.30	-0.53	0.31	0.11	0.00	-0.48	-0.18	0.10	-0.16	-0.33
Full-time employment %	-0.05	0.26	0.03	-0.23	-0.42	-0.13	0.36	-0.36	0.17	0.16
Self-employment %	-0.46	0.35	0.25	-0.49	-0.31	-0.33	0.24	-0.20	0.26	0.31
Total employment %	-0.20	0.27	0.25	-0.43	-0.55	-0.43	0.40	-0.41	0.25	0.22

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
House price	0.33	0.24	-0.60	0.29	0.41	0.07	-0.50	0.13	0.77	0.38
Private rented %	0.26	0.16	-0.48	0.58	0.29	-0.23	-0.69	0.35	0.45	0.36
Average rooms per household	0.26	0.24	-0.19	-0.18	0.25	0.17	0.00	-0.26	0.67	0.11
Income Support claimants %	-0.11	-0.20	0.54	-0.24	-0.40	-0.06	0.14	-0.48	-0.47	-0.65
Public transport travel time (mins)	-0.46	-0.29	0.19	-0.16	-0.16	0.07	0.31	0.12	-0.44	-0.03
Ethnic group: white %	0.01	-0.03	-0.39	-0.19	0.19	0.46	0.33	0.23	0.23	0.43
Economically active %	0.14	0.06	-0.55	0.28	0.62	-0.15	-0.12	0.86	0.39	0.96
Households: detached %	0.07	0.02	-0.34	0.02	-0.03	0.40	-0.12	-0.17	0.46	0.05
Households: semi-detached %	-0.26	0.07	0.15	-0.22	-0.04	0.07	0.27	-0.14	-0.03	-0.07
Households: terraced %	-0.07	-0.15	0.48	-0.20	-0.13	-0.26	0.30	-0.05	-0.46	-0.20
Households: flats/maisonettes %	0.30	0.11	-0.53	0.43	0.20	0.05	-0.53	0.26	0.35	0.27
Households: owner-occupied %	-0.03	0.08	-0.14	-0.20	0.28	0.11	0.31	0.03	0.25	0.25
Households: social rented %	-0.12	-0.16	0.40	-0.15	-0.42	0.03	0.11	-0.23	-0.49	-0.43
Average household size	-0.13	0.04	0.69	-0.09	-0.34	-0.43	0.00	-0.42	-0.31	-0.55
Overcrowded households %	-0.03	-0.01	0.31	0.34	-0.32	-0.41	-0.48	-0.13	-0.33	-0.43
One-person households %	0.15	-0.02	-0.64	0.20	0.19	0.40	-0.18	0.36	0.24	0.40
Couples with dependent children %	-0.09	0.08	0.65	-0.18	-0.19	-0.43	0.10	-0.36	-0.20	-0.41

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
Green spaces less than 1.5km	0.07	0.01	-0.19	-0.03	0.30	0.00	-0.16	0.17	0.26	0.25
British Rail and London Underground less than 1.5km	0.20	0.19	-0.30	0.17	0.36	-0.12	-0.33	0.16	0.31	0.22
Schools less than 2km	1.00	0.34	-0.19	0.08	0.20	-0.02	-0.13	-0.04	0.34	0.10
Average KS3 scores	0.34	1.00	-0.10	-0.11	0.16	0.08	0.00	-0.04	0.25	0.09
People aged 0-19 years %	-0.19	-0.10	1.00	-0.30	-0.51	-0.46	0.32	-0.43	-0.59	-0.61
People aged 20-29 years %	0.08	-0.11	-0.30	1.00	-0.19	-0.42	-0.64	0.39	-0.02	0.17
People aged 30-64 years %	0.20	0.16	-0.51	-0.19	1.00	-0.08	-0.07	0.43	0.52	0.65
People aged 65 years and above %	-0.02	0.08	-0.46	-0.42	-0.08	1.00	0.27	-0.23	0.27	0.01
Part-time employment %	-0.13	0.00	0.32	-0.64	-0.07	0.27	1.00	-0.24	-0.22	-0.04
Full-time employment %	-0.04	-0.04	-0.43	0.39	0.43	-0.23	-0.24	1.00	-0.03	0.84
Self-employment %	0.34	0.25	-0.59	-0.02	0.52	0.27	-0.22	-0.03	1.00	0.44
Total employment %	0.10	0.09	-0.61	0.17	0.65	0.01	-0.04	0.84	0.44	1.00

3.5 Submarket 5: Leafy Retreat

The five most significant variables that explain the variation in house prices in the Leafy Retreat submarket are (in order of significance):

1. The proportion of self-employed people
2. Households in owner-occupied dwellings
3. Households in socially rented accommodation
4. Households living in detached properties
5. The number of British Rail and London Underground stations within a radius of 1.5km.

Table 22. Model summary

R	R Square	Adjusted R Square	Standard error of the estimate
0.74	0.55	0.54	0.24

The R^2 (0.55) shows that a little more than half of the variation in house prices is explained by the variables above.

Table 23. Analysis of variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	13.83	5	2.77	46.08	0.00
Residual	11.40	190	0.06		
Total	25.23	195			

The significance value of the F statistic is less than 0.05 and highly significant. The null hypothesis that house prices are not linearly related to all the explanatory variables can be rejected.

Table 24. Coefficients

	Unstandardised Coefficients		Standardised Coefficients	t	Sig	95% Confidence Interval for B		Correlations			Collinearity statistics	
	B	Standard error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	13.18	0.45		29.56	0.00	12.30	14.06					
Households: owner-occupied	-0.02	0.00	-0.39	-4.26	0.00	-0.03	-0.01	-0.27	-0.30	-0.21	0.29	3.50
Self-employed people	0.05	0.01	0.45	6.21	0.00	0.04	0.07	0.68	0.41	0.30	0.45	2.24
Households: detached	0.00	0.00	0.23	3.39	0.00	0.00	0.01	0.40	0.24	0.17	0.51	1.96
British Rail and London Underground less than 1.5km	0.03	0.01	0.13	2.22	0.03	0.00	0.06	0.11	0.16	0.11	0.74	1.35
Households: socially rented	-0.02	0.01	-0.26	-3.04	0.00	-0.03	-0.01	-0.10	-0.22	-0.15	0.33	2.99

The t statistics are all significant at the 95 per cent confidence interval. There is slight multicollinearity due to the variable of households in owner occupied dwellings. House prices are highly correlated with self-employed people and households in detached properties.

Table 25. Correlations

		Log of house prices	Households: owner-occupied	Self employed people	Households: detached	British Rail and London Underground less than 1.5km	Households socially rented
Pearson Correlation	Log of house prices	1.00	-0.27	0.68	0.40	0.11	-0.10
	Households: owner-occupied	-0.27	1.00	-0.22	0.25	-0.12	-0.70
	Self-employed people	0.68	-0.22	1.00	0.55	-0.10	-0.10
	Households: detached	0.40	0.25	0.55	1.00	-0.29	-0.21
	British Rail and London Underground less than 1.5km	0.11	-0.12	-0.10	-0.29	1.00	-0.19
	Households socially rented	-0.10	-0.70	-0.10	-0.21	-0.19	1.00
Sig. (1-tailed)	Log of house prices	.	0.00	0.00	0.00	0.06	0.07
	Households: owner-occupied	0.00	.	0.00	0.00	0.05	0.00
	Self employed people	0.00	0.00	.	0.00	0.09	0.07
	Households: detached	0.00	0.00	0.00	.	0.00	0.00
	British Rail and London Underground less than 1.5km	0.06	0.05	0.09	0.00	.	0.00
	Households socially rented	0.07	0.00	0.07	0.00	0.00	.

Table 26 Overall Correlations

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
House price	1.00	0.46	0.54	-0.20	-0.23	-0.12	-0.37	0.40	-0.50
Private rented %	0.46	1.00	-0.08	0.14	-0.39	-0.27	0.07	-0.16	-0.35
Average rooms per household	0.54	-0.08	1.00	-0.11	0.10	-0.05	-0.57	0.86	-0.43
Income Support claimants %	-0.20	0.14	-0.11	1.00	-0.03	-0.24	-0.14	-0.09	0.03
Public transport travel time (mins)	-0.23	-0.39	0.10	-0.03	1.00	0.40	0.03	0.34	-0.02
Ethnic group: white %	-0.12	-0.27	-0.05	-0.24	0.40	1.00	0.14	0.05	-0.08
Economically active %	-0.37	0.07	-0.57	-0.14	0.03	0.14	1.00	-0.52	0.20
Households: detached %	0.40	-0.16	0.86	-0.09	0.34	0.05	-0.52	1.00	-0.55
Households: semi-detached %	-0.50	-0.35	-0.43	0.03	-0.02	-0.08	0.20	-0.55	1.00
Households: terraced %	-0.29	0.01	-0.58	0.01	-0.09	0.17	0.47	-0.62	0.00
Households: flats /maisonettes %	0.26	0.70	-0.30	0.07	-0.47	-0.16	0.16	-0.34	-0.39
Households: owner-occupied %	-0.27	-0.79	0.28	-0.32	0.26	0.15	-0.07	0.25	0.34
Households: social rented %	-0.10	0.12	-0.37	0.37	0.04	0.08	0.03	-0.21	-0.15
Average household size	-0.02	-0.25	0.39	0.10	0.05	-0.45	-0.15	0.21	0.32
Overcrowded households %	0.08	0.62	-0.45	0.28	-0.37	-0.50	0.19	-0.46	-0.06
One-person households %	0.08	0.49	-0.47	0.05	-0.25	0.16	0.18	-0.39	-0.30
Couples with dependent children %	0.07	-0.18	0.40	-0.08	0.00	-0.36	0.00	0.18	0.22
Green spaces less than 1.5km	0.11	0.22	-0.01	0.19	-0.18	-0.10	-0.11	-0.03	-0.14
British Rail and London Underground less than 1.5km	0.11	0.33	-0.17	-0.08	-0.46	-0.36	0.23	-0.29	-0.03
Schools less than 2km	0.08	0.39	-0.24	0.05	-0.50	-0.18	0.05	-0.42	0.00
Average KS3 scores	-0.20	0.05	-0.20	0.10	-0.41	-0.17	-0.02	-0.27	0.11
People aged 0-19 years %	-0.22	-0.22	-0.03	0.03	0.09	-0.09	0.16	-0.13	0.23
People aged 20-29 years %	0.05	0.62	-0.36	0.17	-0.47	-0.42	0.39	-0.44	-0.07
People aged 30-64 years %	0.02	-0.15	-0.02	-0.30	0.27	0.30	0.36	0.07	-0.06
People aged 65 years and above %	0.09	-0.25	0.32	0.05	0.14	0.19	-0.64	0.38	-0.06
Part-time employment %	-0.53	-0.76	-0.12	-0.15	0.41	0.28	0.23	-0.03	0.51

	House price	Private rented %	Average rooms per household	Income Support claimants %	Public transport travel time (mins)	Ethnic group: white %	Economically active %	Households: detached %	Households: semi-detached %
Full-time employment %	-0.50	0.03	-0.71	-0.14	-0.12	0.08	0.85	-0.64	0.23
Self-employment %	0.68	0.40	0.64	0.12	-0.02	-0.05	-0.43	0.55	-0.49
Total employment %	-0.35	0.04	-0.49	-0.17	0.02	0.22	0.95	-0.44	0.13

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
House price	-0.29	0.26	-0.27	-0.10	-0.02	0.08	0.08	0.07	0.11	0.11
Private rented %	0.01	0.70	-0.79	0.12	-0.25	0.62	0.49	-0.18	0.22	0.33
Average rooms per household	-0.58	-0.30	0.28	-0.37	0.39	-0.45	-0.47	0.40	-0.01	-0.17
Income Support claimants %	0.01	0.07	-0.32	0.37	0.10	0.28	0.05	-0.08	0.19	-0.08
Public transport travel time (mins)	-0.09	-0.47	0.26	0.04	0.05	-0.37	-0.25	0.00	-0.18	-0.46
Ethnic group: white %	0.17	-0.16	0.15	0.08	-0.45	-0.50	0.16	-0.36	-0.10	-0.36
Economically active %	0.47	0.16	-0.07	0.03	-0.15	0.19	0.18	0.00	-0.11	0.23
Households: detached %	-0.62	-0.34	0.25	-0.21	0.21	-0.46	-0.39	0.18	-0.03	-0.29
Households: semi-detached %	0.00	-0.39	0.34	-0.15	0.32	-0.06	-0.30	0.22	-0.14	-0.03
Households: terraced %	1.00	0.09	-0.16	0.25	-0.18	0.20	0.23	-0.14	0.08	0.14
Households: flats/maisonettes %	0.09	1.00	-0.66	0.26	-0.60	0.62	0.82	-0.44	0.16	0.41
Households: owner-occupied %	-0.16	-0.66	1.00	-0.70	0.35	-0.69	-0.59	0.33	-0.26	-0.12
Households: social rented %	0.25	0.26	-0.70	1.00	-0.28	0.41	0.39	-0.33	0.17	-0.19
Average household size	-0.18	-0.60	0.35	-0.28	1.00	-0.09	-0.87	0.87	-0.12	-0.05
Overcrowded households %	0.20	0.62	-0.69	0.41	-0.09	1.00	0.43	-0.12	0.08	0.40
One-person households %	0.23	0.82	-0.59	0.39	-0.87	0.43	1.00	-0.74	0.16	0.21
Couples with dependent children %	-0.14	-0.44	0.33	-0.33	0.87	-0.12	-0.74	1.00	-0.11	0.00
Green spaces less than 1.5km	0.08	0.16	-0.26	0.17	-0.12	0.08	0.16	-0.11	1.00	-0.13
British Rail and London Underground less than 1.5km	0.14	0.41	-0.12	-0.19	-0.05	0.40	0.21	0.00	-0.13	1.00
Schools less than 2km	0.18	0.54	-0.32	0.07	-0.22	0.38	0.39	-0.18	0.08	0.37
Average KS3 scores	0.08	0.26	-0.02	-0.02	-0.17	0.10	0.24	-0.12	0.18	0.19

	Households: terraced %	Households: flats/ maisonettes %	Households: owner-occupied %	Households: social rented %	Average household size	Over-crowded households %	One-person households %	Couples with dependent children %	Green spaces less than 1.5km	British Rail and LU less than 1.5km
People aged 0-19 years %	0.21	-0.29	0.03	0.22	0.53	0.04	-0.42	0.65	-0.07	-0.12
People aged 20-29 years %	0.26	0.58	-0.49	0.07	-0.10	0.65	0.35	-0.12	0.11	0.44
People aged 30-64 years %	0.11	-0.11	0.23	-0.21	-0.15	-0.31	-0.05	-0.02	-0.16	0.05
People aged 65 years and above %	-0.41	-0.19	0.21	-0.06	-0.17	-0.33	0.03	-0.31	0.07	-0.30
Part-time employment %	0.10	-0.69	0.61	-0.10	0.32	-0.50	-0.50	0.30	-0.23	-0.35
Full-time employment %	0.54	0.28	-0.07	0.08	-0.32	0.23	0.32	-0.18	-0.09	0.33
Self-employment %	-0.43	0.11	-0.22	-0.10	0.10	0.01	-0.02	0.09	0.13	-0.10
Total employment %	0.42	0.16	0.00	-0.04	-0.20	0.08	0.19	-0.02	-0.13	0.20

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
House price	0.08	-0.20	-0.22	0.05	0.02	0.09	-0.53	-0.50	0.68	-0.35
Private rented %	0.39	0.05	-0.22	0.62	-0.15	-0.25	-0.76	0.03	0.40	0.04
Average rooms per household	-0.24	-0.20	-0.03	-0.36	-0.02	0.32	-0.12	-0.71	0.64	-0.49
Income Support claimants %	0.05	0.10	0.03	0.17	-0.30	0.05	-0.15	-0.14	0.12	-0.17
Public transport travel time (mins)	-0.50	-0.41	0.09	-0.47	0.27	0.14	0.41	-0.12	-0.02	0.02
Ethnic group: white %	-0.18	-0.17	-0.09	-0.42	0.30	0.19	0.28	0.08	-0.05	0.22
Economically active %	0.05	-0.02	0.16	0.39	0.36	-0.64	0.23	0.85	-0.43	0.95
Households: detached %	-0.42	-0.27	-0.13	-0.44	0.07	0.38	-0.03	-0.64	0.55	-0.44
Households: semi-detached %	0.00	0.11	0.23	-0.07	-0.06	-0.06	0.51	0.23	-0.49	0.13
Households: terraced %	0.18	0.08	0.21	0.26	0.11	-0.41	0.10	0.54	-0.43	0.42
Households: flats/maisonettes %	0.54	0.26	-0.29	0.58	-0.11	-0.19	-0.69	0.28	0.11	0.16
Households: owner-occupied %	-0.32	-0.02	0.03	-0.49	0.23	0.21	0.61	-0.07	-0.22	0.00
Households: social rented %	0.07	-0.02	0.22	0.07	-0.21	-0.06	-0.10	0.08	-0.10	-0.04
Average household size	-0.22	-0.17	0.53	-0.10	-0.15	-0.17	0.32	-0.32	0.10	-0.20
Overcrowded households %	0.38	0.10	0.04	0.65	-0.31	-0.33	-0.50	0.23	0.01	0.08
One-person households %	0.39	0.24	-0.42	0.35	-0.05	0.03	-0.50	0.32	-0.02	0.19
Couples with dependent children %	-0.18	-0.12	0.65	-0.12	-0.02	-0.31	0.30	-0.18	0.09	-0.02

	Schools less than 2km	Average KS3 scores	People aged 0-19 years %	People aged 20-29 years %	People aged 30-64 years %	People aged 65 years and above %	Part-time employment %	Full-time employment %	Self-employment %	Total employment %
Green spaces less than 1.5km	0.08	0.18	-0.07	0.11	-0.16	0.07	-0.23	-0.09	0.13	-0.13
British Rail and London Underground less than 1.5km	0.37	0.19	-0.12	0.44	0.05	-0.30	-0.35	0.33	-0.10	0.20
Schools less than 2km	1.00	0.40	-0.10	0.39	-0.20	-0.12	-0.38	0.23	-0.11	0.04
Average KS3 scores	0.40	1.00	-0.05	0.11	-0.23	0.10	-0.11	0.22	-0.23	0.04
People aged 0-19 years %	-0.10	-0.05	1.00	-0.19	-0.09	-0.45	0.35	0.06	-0.20	0.08
People aged 20-29 years %	0.39	0.11	-0.19	1.00	-0.19	-0.54	-0.49	0.41	-0.06	0.28
People aged 30-64 years %	-0.20	-0.23	-0.09	-0.19	1.00	-0.44	0.18	0.28	-0.10	0.42
People aged 65 years and above %	-0.12	0.10	-0.45	-0.54	-0.44	1.00	0.03	-0.54	0.25	-0.54
Part-time employment %	-0.38	-0.11	0.35	-0.49	0.18	0.03	1.00	0.13	-0.51	0.22
Full-time employment %	0.23	0.22	0.06	0.41	0.28	-0.54	0.13	1.00	-0.73	0.84
Self-employment %	-0.11	-0.23	-0.20	-0.06	-0.10	0.25	-0.51	-0.73	1.00	-0.37
Total employment %	0.04	0.04	0.08	0.28	0.42	-0.54	0.22	0.84	-0.37	1.00

4. Submarket analysis compared to the overall market analysis

Econometric tests to compare the relative merits of the explanatory variables in a market-wide and submarket model can be performed to see the benefits of a submarket study. This can be done by comparing the reduction in the residual sum of squares (RSS)[14] of the submarket model with respect to the overall market model. Any given model can be evaluated by its quality of fit to the data, as determined by the RSS, and the number of variables used (where having more variables is considered unfavourable).

Table 27. RSS for submarket and market wide models

	RSS Central	RSS Crowded House	RSS Pleasant Crescent	RSS Suburban London	RSS Leafy Retreat	RSS total	n
Overall on mean						180.7	1
Overall all variables						39.6	27
Submarket on mean	29.3	15.4	27.8	21.6	25.2	119.5	5
Submarket 3 variables	15.4	5.1	4.3	6.7	10.3	41.7	20
Submarket 4 variables	14.4	5.0	4.0	6.2	9.5	39.1	25
Submarket 5 variables	13.8	4.4	3.5	5.6	8.8	36.1	30

Notes: Some of the RSS totals do not sum to the previous five columns due to rounding.
n: degrees of freedom including constant

If house prices are regressed on a constant alone then the RSS for the overall market is 180.7 (as can be seen in the first row of Table 27). This is the simplest possible model and can be considered as the base case to compare against other regressions. Splitting the regression into five clusters and repeating this process, reduces the total RSS to 119.5. This constitutes a significant improvement on the base case, with an RSS reduction of around a third, for the penalty of effectively introducing four extra variables. The formulae for these two RSS can be seen below.

RSS definitions

Overall on mean: $RSS_{overall} = \sum_i (x_i - \bar{x})^2$

[where the summation and mean are taken over all observations]

Submarket on mean: $RSS_{cluster.mean} = \sum_{j=1}^{5} \sum_i (x_{ij} - \bar{x}_j)^2$

[where j covers the five clusters, i covers the observations in cluster j and the mean is taken over all observations in cluster j]

[14] Residual or unexplained variation of the Y values about the regression line (Σe_i^2). This accounts for other random factors, which are not accounted for by the model. Reducing RSS improves the fit of the model.

The RSS of the overall equation is then compared by including 26 explanatory variables ($RSS_{overall}$=39.6) with the sum of the RSS of all the clusters ($RSS_{submarket}$=39.1), but only with four explanatory variables for each cluster. Using just four explanatory variables in each cluster and 20 explanatory variables in total provides a similar RSS to the overall model, which has 26 explanatory variables. By using five explanatory variables for each cluster, or 25 explanatory variables in total, compared to 26 for the overall market, the RSS falls further to 36.1, a reduction of 8.8 per cent from the overall market.

5. Limitations and considerations

Some of the limitations and considerations highlighted in *Working paper 3: Valuing Greenness: Is there a Segmented Preference for Housing Attributes in London?*' (GLA Economics, 2003) have been overcome in this study. However, certain methodological and measurement errors are inherent in hedonic pricing models.

- **Measurement error**: There will be errors in the observed values of the dependent and explanatory variables. The statistical model also depends on the choice of, and weights attached to, significant indicators. The results are dependent on the functional form of the model. Unique or optimal results cannot be obtained as conclusions are restricted by data availability and ease of calculation.

- **Multicollinearity**: Multicollinearity is a serious problem in hedonic models and arises when the effects of several variables are closely linked. If multicollinearity exists, then it becomes hard to determine which of several correlated variables is truly influential.

- Some pairs of indicators (as seen from the scatter plot matrices in the main report, *London's Housing Submarkets*, and correlation coefficients) appear to have a curvilinear relationship. Taking squares for these indicators can remove the bias but then it becomes difficult to interpret the data. With five degrees of freedom there may be some problems with the heterogeneity of the variances.

- The main criticism of submarket housing analysis is the process of identifying submarkets. Households' choices and preferences differ considerably and their pattern of substitutability is unpredictable. Empirical analysis such as this fails to take into account the range of ways households acquire and use information about housing availability, and the ways they match their preferences to housing supply (Palm, 1978).

- Submarkets are dynamic in nature and require re-identification on a regular basis (Tu, 2003). This means that comparisons over time would not be possible as the base data would change in every period.

Conclusion

This working paper has used a systematic method to identify housing submarkets in London. Housing attributes have been used to form the submarkets instead of segmenting them on an ad hoc basis. This study also shows the key variables that drive each submarket. The regression and correlation analysis shows that variables are differently associated with house prices for each submarket. They are different in terms of magnitude and sometimes in terms of sign (positive/negative). A simple analysis in terms of the residual sum of squares (RSS) compares the submarket analysis with the overall market analysis. The RSS test shows that the submarket analysis provides a higher statistical explanation compared to the market-wide model.

The next stage would be to undertake an analysis that is disaggregated below the postcode sector level. The results from the hedonic submarket approach used in this study can be further improved by using data for individual properties. This would remove some of the bias encountered in this study and provide highly representative housing submarkets.

Appendix A

Housing submarket variables

This dataset contains house prices at postcode sector level by property type from the first quarter of 2002 to the second quarter of 2003. An average for all six quarters has been calculated. The variables in the dataset have also been computed at postcode[15] sector level using a geographic information system.

Table A.1 Variables used in the study

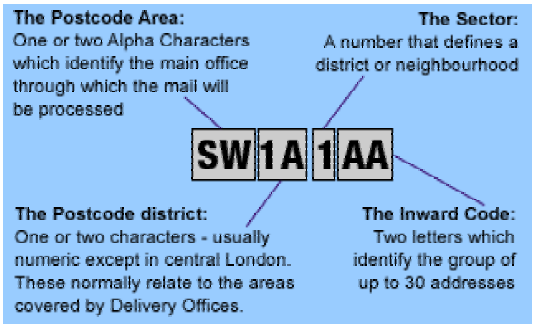
No.	Variable	Description	Source
1	House price	Average overall house price over six quarters Q1-02 to Q2-03	Land Registry
2	Private rented %	Percentage of households: private rented (private landlord or letting agency and others)	Census 2001, ONS
3	Average rooms/household	Average number of rooms per household[Δ]	Census 2001, ONS
4	Income support claimants %	Percentage of people who are Income Support claimants*, all ages, 2000	Neighbourhood statistics, ONS
5	Travel time by public transport (mins)	Travel time to Central London by public transport (mins), 2001. This has been averaged for each postcode sector. Central London is defined as roughly the same as zone 1 of the underground map. Transport for London divides London into 1,019 travel zones. The following modelling periods have been used: morning (07:00-09:59), interpeak (10:00-15:59) and evening peak (16:00-18:59).	Transport for London, GLA Economics
6	Ethnicity white %	Percentage of people in ethnic groups: white (British, Irish and other white)	Census 2001, ONS
7	Economically active %	Percentage of people aged 16-74 employed part-time**, full-time**, self-employed, unemployed or full-time student	Census 2001, ONS
8	Household: detached %	Percentage of household spaces of detached type	Census 2001, ONS
9	Households: semi-detached %	Percentage of household spaces of semi-detached type	Census 2001, ONS
10	Households: terraced %	Percentage of household spaces of terraced type (including end-terrace)	Census 2001, ONS
11	Households: flats/maisonettes %	Percentage of household spaces that are flats, maisonettes or apartments	Census 2001, ONS
12	Households: owner-occupied %	Percentage of households: owner-occupied (owns outright, owns with a mortgage or loan, or shared ownership)	Census 2001, ONS
13	Households: social rented %	Percentage of households: social renting (housing association/registered social landlord or council/local authority)	Census 2001, ONS
14	Average household size	Average household size	Census 2001, ONS
15	Overcrowded households %	Percentage of households with an occupancy rating[++] of –1 or less	Census 2001, ONS
16	One-person households %	Percentage of household comprising one person household (pensioner or other)	Census 2001, ONS

[15] See Notes at the end of this section.

17	Couple with dependent children households%	Percentage of households comprising couples with dependent children (married, cohabiting or others)	Census 2001, ONS
18	Green spaces less 1.5km	Number of open green space sites within a 1.5 km radius	GLA Economics and the GLA Biodiversity Unit
19	British Rail and London Underground less than 1.5km	Number of British rail or London underground stations within a 1.5 km radius	Greater London Authority
20	Schools less than 2km	Number of schools within a 2km radius	GLA Economics and Department for Education and Skills
21	Average KS3 scores	Average Key Stage 3 point score of schools within a radius of 2km in 2002 (901 postcode sectors)	GLA Economics and Department for Education and Skills
22	People aged 0-19 years %	Percentage of people aged 0-19 years	Census, ONS 2001
23	People aged 20-29 years %	Percentage of people aged 20-29 years	Census, ONS 2001
24	People aged 30-64 years %	Percentage of people aged 30-64 years	Census, ONS 2001
25	People aged 65 years and above %	Percentage of people aged 65 years and above	Census, ONS 2001
26	Part time employment %	Percentage of people aged 16-74 employed part time**	Census, ONS 2001
27	Full-time employment %	Percentage of people aged 16-74 employed full time**	Census, ONS 2001
28	Self-employment %	Percentage of people aged 16-74 who are self-employed	Census, ONS 2001
29	Total employment %	Total of part time, full time and self employed as a percentage of all people aged 16 – 74 years	Census, ONS 2001
	All households	Number of households, 2001	Census, ONS 2001 and GLA Economics
	All people	Total number of people	Census 2001, ONS

Notes:

Postcode sector



Source: Land Registry

The aggregate nature of the data is not an ideal form of measurement for hedonic regression analysis. This is because the variables are at postcode sector level and are therefore not unique to any individual properties. These variables are shown in a ratio/percentage format (values between 0 and 1), which are more representative. For example, for the owner-occupied variable we have used the ratio of the total number of owner-occupied households to the total number of households. The variables from the Census survey have been aggregated from Census output areas[16] *and are thus more accurate than the other variables.*

[16] In 2001, the output area is the Census Area. It is the smallest area for which Census data are available. The output area is an aggregate of contiguous unit postcodes where the households have a certain uniformity based on mostly tenure but also using other factors.

Δ This variable records the number of rooms in a household space. Bathrooms, toilets, halls or landings, or rooms that can only be used for storage are not counted. All other rooms, for example, kitchens, living rooms, bedrooms, utility rooms and studies are counted. If two rooms have been converted into one, they are counted as one room. Rooms shared between a number of households, for example a shared bathroom or kitchen, are not counted. This figure is then divided by the number of residents in the household. The total number of household rooms are added together and divided by the number of residents to give average figures. Please note that this calculation is not exact as more than 12 rooms and more than eight household residents are rounded down to these figures.

** Income Support is a non-contributory benefit. From October 1996, the Jobseeker's Allowance replaced Income Support for unemployed people. In general Income Support is now only available to people who are not required to be available for work such as pensioners, lone parents, the sick and disabled people. The conditions for entitlement are in the Income Support regulations.*

*** For the Census, part time is defined as working 30 hours or less a week. Full time is defined as working more than 30 hours a week.*

++ The occupancy rating provides a measure of under-occupancy and overcrowding. For example, a value of -1 implies that there is one room too few and that there is over-crowding in the household. The occupancy rating assumes that every household, including one-person households, require a minimum of two common rooms (excluding bathrooms).

Appendix B. References

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Hindi
यदि आप इस दस्तावेज़ की प्रति अपनी भाषा में चाहते हैं, तो कृपया निम्नलिखित नम्बर पर फोन करें अथवा दिये गये पता पर सम्पर्क करें।

Vietnamese
Tiếng Việt
Nếu bạn muốn bản sao của tài liệu này bằng ngôn ngữ của bạn, hãy gọi điện theo số hoặc liên lạc với địa chỉ dưới đây.

Bengali
আপনি যদি আপনার ভাষায় এই দলিলের প্রতিলিপি (কপি) চান, তা হলে নীচের ফোন্ নম্বরে বা ঠিকানায় অনুগ্রহ করে যোগাযোগ করুন।

Greek
Αν θα θέλατε ένα αντίγραφο του παρόντος εγγράφου στη γλώσσα σας, παρακαλώ να τηλεφωνήσετε στον αριθμό ή να επικοινωνήσετε στην παρακάτω διεύθυνση.

Urdu
اگر آپ اِس دستاویز کی نقل اپنی زبان میں چاہتے ہیں، تو براہِ کرم نیچے دیئے گئے نمبر پر فون کریں یا دیئے گئے پتہ پر رابطہ قائم کریں۔

Turkish
Bize telefon ederek ya da yukarıdaki adrese başvurarak bu belgenin Türkçe'sini isteyebilirsiniz.

Arabic
إذا أردت نسخة من هذه الوثيقة بلغتك، الرجاء الاتصال برقم الهاتف او الكتابة الى العنوان

Punjabi
ਜੇ ਤੁਹਾਨੂੰ ਇਸ ਦਸਤਾਵੇਜ਼ ਦੀ ਕਾਪੀ ਤੁਹਾਡੀ ਆਪਣੀ ਭਾਸ਼ਾ ਵਿਚ ਚਾਹੀਦੀ ਹੈ, ਤਾਂ ਹੇਠ ਲਿਖੇ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ ਹੇਠ ਲਿਖੇ ਪਤੇ 'ਤੇ ਰਾਬਤਾ ਕਰੋ:

Gujarati
જો તમને આ દસ્તાવેજની નકલ તમારી ભાષામાં જોઈતી હોય તો, કૃપા કરી આપેલ નંબર ઉપર ફોન કરો અથવા નીચેના સરનામે સંપર્ક સાધો.

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