**ASSIGNMENT 4**

A central Athens area real estate appraiser used regression analysis to explore the relationship between the sale prices of apartments and various characteristics of the apartments and the apartment buildings.

The variables collected from a random sample of 25 apartments are the following:

**Sale Price**: The sale price of the apartment (in €)

**Apartments**: Number of apartments in the Building

**Age of Structure**: Age of structure of the building (in years)

**Apartment Size**: Apartment size (area in squared meters)

**Park Spaces**: Number of car park spaces in the building

**Building Condition**: Condition of the apartment building, coded as follows:

E (excellent), G (good) and F (fair)

**Note**: Specify two dummy variables (one for Excellent and one for Good) in order to incorporate into your model the building condition

###### From the given variables, build a linear regression model that explains the sale prices of apartments.

1. Use the least squares method to estimate your model.

**Note**: the non-significant variables must be excluded

2. State the estimated regression equation.

3. Comment on the significance of the regression coefficients.

4. Give the interpretation of the regression coefficients.

5. Determine the coefficient of determination and explain its meaning.

6. Perform a residual analysis [i.e. plot the residuals versus observation (apartment)]. Is there any evidence of a pattern in the residuals? Explain.

7. Using the above model estimate the predicted average sale price for a 100 m2 apartment, located in a 20 years old building in fair condition, with no car park spaces, which accommodates 25 apartments.

8. Set up a 95% confidence interval estimate of your prediction (use the standard error of the regression equation as a proxy of prediction standard error).

9. Do you trust the above prediction? Explain.

10. The president of the Hellenic Association of Appraisers claims that, if we exclude the car park spaces (and the non-significant variables), the apartments of buildings which have been reconditioned and therefore are either in excellent or in good condition, have on average a 55,2% or 29,6%, respectively, higher sale prices. Is his claim correct? Explain.

Note: Your analysis should be based on the estimation of the log-linear model which gives the elasticities

**Selected Data for a Sample of 25 Apartments**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Apartment** | **Sale Price** | **Apartments** | **Age of structure** | **Apartment Size** | **Park Spaces** | **Building Condition** |
| 1 | 90300 | 4 | 82 | 43 | 0 | F |
| 2 | 384000 | 20 | 13 | 144 | 0 | G |
| 3 | 157500 | 5 | 66 | 66 | 0 | G |
| 4 | 676200 | 26 | 64 | 341 | 6 | E |
| 5 | 165000 | 5 | 55 | 61 | 0 | G |
| 6 | 300000 | 10 | 65 | 146 | 0 | G |
| 7 | 108750 | 4 | 82 | 30 | 0 | G |
| 8 | 276538 | 11 | 23 | 79 | 0 | G |
| 9 | 420000 | 20 | 18 | 126 | 20 | G |
| 10 | 950000 | 62 | 71 | 394 | 23 | G |
| 11 | 560000 | 26 | 74 | 300 | 12 | G |
| 12 | 268000 | 13 | 56 | 81 | 13 | F |
| 13 | 290000 | 9 | 76 | 113 | 0 | E |
| 14 | 173200 | 6 | 21 | 45 | 6 | G |
| 15 | 323650 | 11 | 24 | 90 | 8 | G |
| 16 | 162500 | 5 | 19 | 38 | 5 | G |
| 17 | 353500 | 20 | 62 | 137 | 2 | F |
| 18 | 134400 | 4 | 70 | 47 | 0 | E |
| 19 | 187000 | 8 | 19 | 74 | 0 | G |
| 20 | 155700 | 4 | 57 | 60 | 0 | E |
| 21 | 93600 | 4 | 82 | 38 | 0 | F |
| 22 | 110000 | 4 | 50 | 31 | 0 | G |
| 23 | 573200 | 14 | 10 | 237 | 14 | E |
| 24 | 79300 | 4 | 82 | 39 | 0 | F |
| 25 | 272000 | 5 | 82 | 95 | 0 | E |

