Scientists have predicted that an increase in sea level is one of the likely consequences of

climate change associated with the enhanced greenhouse effect. The sea level of a particular

place is measured using tide gauges. A tide gauge is a device built to measure water-level

variations due to tides and weather and to eliminate effects due to waves. The file

Assignment2-Q2.xls contains time series data on sea level at Fort Denison in Sydney Harbour

from 1949 to 2006. Consider the simple regression model

*SEALEVEL =* \_*0 +*\_*1YEAR +* \_

(a) Estimate this model and report the results.

(b) Interpret the estimate for \_*1*.

(c) Why is it difficult to interpret the estimate for \_*0*?

(d) Test a null hypothesis that the average sea level is not changing against an alternative

that it is changing over time. Use a 5% significance level.

(e) Without carrying out a formal hypothesis test, can you say immediately what the test

decision in (d) would be if the alternative was that the average sea level is increasing?

(f) Predict the sea level in 2008.

(g) Find a 95% interval prediction for the sea level in 2008 (Hint: you may use Excel

command =DEVSQ(A#:A##) to calculate *SSx*.)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SOURCE | http://www.pol.ac.uk/psmsl/pubi/met.monthly.data/680140.metdata | | | | | | |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| mean sea level for each year at fort denison in sydney harbour (mm's) | | | | | | |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Year** | **mm's** |  |  |  |  |  |  |  |  |  |  |
| 1949 | 912 |  |  |  |  |  |  |  |  |  |  |
| 1950 | 938 |  |  |  |  |  |  |  |  |  |  |
| 1951 | 951 |  |  |  |  |  |  |  |  |  |  |
| 1952 | 933 |  |  |  |  |  |  |  |  |  |  |
| 1953 | 914 |  |  |  |  |  |  |  |  |  |  |
| 1954 | 913 |  |  |  |  |  |  |  |  |  |  |
| 1955 | 960 |  |  |  |  |  |  |  |  |  |  |
| 1956 | 977 |  |  |  |  |  |  |  |  |  |  |
| 1957 | 925 |  |  |  |  |  |  |  |  |  |  |
| 1958 | 947 |  |  |  |  |  |  |  |  |  |  |
| 1959 | 920 |  |  |  |  |  |  |  |  |  |  |
| 1960 | 927 |  |  |  |  |  |  |  |  |  |  |
| 1961 | 897 |  |  |  |  |  |  |  |  |  |  |
| 1962 | 932 |  |  |  |  |  |  |  |  |  |  |
| 1963 | 922 |  |  |  |  |  |  |  |  |  |  |
| 1964 | 977 |  |  |  |  |  |  |  |  |  |  |
| 1965 | 924 |  |  |  |  |  |  |  |  |  |  |
| 1966 | 928 |  |  |  |  |  |  |  |  |  |  |
| 1967 | 919 |  |  |  |  |  |  |  |  |  |  |
| 1968 | 951 |  |  |  |  |  |  |  |  |  |  |
| 1969 | 906 |  |  |  |  |  |  |  |  |  |  |
| 1970 | 923 |  |  |  |  |  |  |  |  |  |  |
| 1971 | 943 |  |  |  |  |  |  |  |  |  |  |
| 1972 | 921 |  |  |  |  |  |  |  |  |  |  |
| 1973 | 959 |  |  |  |  |  |  |  |  |  |  |
| 1974 | 988 |  |  |  |  |  |  |  |  |  |  |
| 1975 | 958 |  |  |  |  |  |  |  |  |  |  |
| 1976 | 991 |  |  |  |  |  |  |  |  |  |  |
| 1977 | 942 |  |  |  |  |  |  |  |  |  |  |
| 1978 | 973 |  |  |  |  |  |  |  |  |  |  |
| 1979 | 919 |  |  |  |  |  |  |  |  |  |  |
| 1980 | 948 |  |  |  |  |  |  |  |  |  |  |
| 1981 | 962 |  |  |  |  |  |  |  |  |  |  |
| 1982 | 912 |  |  |  |  |  |  |  |  |  |  |
| 1983 | 908 |  |  |  |  |  |  |  |  |  |  |
| 1984 | 964 |  |  |  |  |  |  |  |  |  |  |
| 1985 | 958 |  |  |  |  |  |  |  |  |  |  |
| 1986 | 957 |  |  |  |  |  |  |  |  |  |  |
| 1987 | 926 |  |  |  |  |  |  |  |  |  |  |
| 1988 | 970 |  |  |  |  |  |  |  |  |  |  |
| 1989 | 977 |  |  |  |  |  |  |  |  |  |  |
| 1990 | 995 |  |  |  |  |  |  |  |  |  |  |
| 1991 | 964 |  |  |  |  |  |  |  |  |  |  |
| 1992 | 956 |  |  |  |  |  |  |  |  |  |  |
| 1993 | 920 |  |  |  |  |  |  |  |  |  |  |
| 1994 | 930 |  |  |  |  |  |  |  |  |  |  |
| 1995 | 936 |  |  |  |  |  |  |  |  |  |  |
| 1996 | 948 |  |  |  |  |  |  |  |  |  |  |
| 1997 | 901 |  |  |  |  |  |  |  |  |  |  |
| 1998 | 966 |  |  |  |  |  |  |  |  |  |  |
| 1999 | 955 |  |  |  |  |  |  |  |  |  |  |
| 2000 | 977 |  |  |  |  |  |  |  |  |  |  |
| 2001 | 1019 |  |  |  |  |  |  |  |  |  |  |
| 2002 | 963 |  |  |  |  |  |  |  |  |  |  |
| 2003 | 958 |  |  |  |  |  |  |  |  |  |  |
| 2004 | 954 |  |  |  |  |  |  |  |  |  |  |
| 2005 | 968 |  |  |  |  |  |  |  |  |  |  |
| 2006 | 950 |  |  |  |  |  |  |  |  |  |  |

Question 3

A developer who specializes in summer cottage property is considering purchasing a large

tract of land adjoining a lake. The current owner of the tract has already subdivided the

land into separate building lots and has prepared the lots by removing some of the trees. The

Developer wants to forecast the value of each lot. From previous experience, she knows

that the most important factors affecting the price of the lot are size (lot size), number of

mature trees (Trees), and distance to the lake (Distance). From a nearby area, she gathers

data for 60 recently sold lots. These data are stored in Assignment2-Q3.xls.

(a) Perform a multiple regression in Excel and provide excel output for the regression

model \_\_\_\_\_ \_ \_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_

(b) Write down the equation for regression line.

(c) What is the standard error of estimate? Interpret its value.

(d) What is the coefficient of determination? What does this statistic tell you?

(e) What is the coefficient of determination, adjusted for degrees of freedom? Why does

this value differ from the coefficient of determination? What does this tell you about

the model?

(f) Test the overall utility of the model. What does the p-value of the test statistic tell

you?

(g) Interpret each of the coefficients.

(h) Test to determine whether each of the independent variables is linearly related to the

price of the lot

|  |  |  |  |
| --- | --- | --- | --- |
| Price (Thousands of $) | Lot-size (Hundreds of m2) | number of mature Trees | Distance to the lake in meters |
| 105.4 | 41.2 | 24 | 42 |
| 91.2 | 44.8 | 5 | 71 |
| 183.3 | 21.3 | 72 | 43 |
| 93.8 | 43.9 | 58 | 14 |
| 207.5 | 57.7 | 52 | 12 |
| 130.9 | 33.4 | 78 | 26 |
| 162.3 | 31.4 | 65 | 51 |
| 18.8 | 27.4 | 22 | 0 |
| 80.5 | 26.2 | 68 | 83 |
| 38.3 | 40.0 | 57 | 76 |
| 71.3 | 47.6 | 53 | 35 |
| 55.5 | 31.6 | 36 | 26 |
| 85.7 | 21.6 | 23 | 24 |
| 110.5 | 36.3 | 48 | 98 |
| 85.1 | 47.2 | 61 | 59 |
| 78.3 | 30.5 | 41 | 55 |
| 27.2 | 41.8 | 1 | 60 |
| 70.9 | 20.6 | 20 | 33 |
| 101.4 | 35.3 | 38 | 75 |
| 133.3 | 40.1 | 68 | 0 |
| 117.7 | 35.6 | 24 | 41 |
| 49.7 | 20.6 | 16 | 77 |
| 49.6 | 22.4 | 32 | 86 |
| 83.2 | 45.8 | 77 | 19 |
| 81.3 | 29.4 | 40 | 0 |
| 152.5 | 51.7 | 60 | 34 |
| 112.2 | 27.2 | 0 | 16 |
| 37.1 | 37.0 | 50 | 49 |
| 130.2 | 38.9 | 48 | 63 |
| 39.1 | 32.5 | 25 | 45 |
| 81.9 | 34.0 | 12 | 0 |
| 24.6 | 35.8 | 16 | 34 |
| 101.9 | 32.9 | 44 | 42 |
| 117.6 | 46.4 | 62 | 48 |
| 148.8 | 51.9 | 59 | 39 |
| 60.2 | 28.9 | 0 | 66 |
| 43.7 | 35.2 | 57 | 77 |
| 113.1 | 30.4 | 70 | 78 |
| 38.1 | 38.3 | 24 | 62 |
| 89.2 | 49.2 | 61 | 0 |
| 3.0 | 21.5 | 46 | 83 |
| 55.8 | 41.9 | 10 | 69 |
| 89.7 | 21.8 | 79 | 62 |
| 136.1 | 66.3 | 56 | 34 |
| 44.7 | 28.2 | 73 | 77 |
| 63.2 | 41.9 | 64 | 65 |
| 163.4 | 46.7 | 69 | 27 |
| 64.1 | 32.1 | 12 | 0 |
| 98.7 | 38.5 | 59 | 77 |
| 139.9 | 27.6 | 0 | 0 |
| 92.0 | 47.0 | 65 | 37 |
| 66.6 | 20.7 | 24 | 51 |
| 16.4 | 34.0 | 12 | 75 |
| 131.9 | 31.9 | 76 | 63 |
| 11.0 | 28.0 | 2 | 42 |
| 27.9 | 40.0 | 52 | 84 |
| 103.5 | 46.6 | 26 | 70 |
| 107.0 | 23.2 | 11 | 83 |
| 51.6 | 46.4 | 53 | 44 |
| 133.4 | 32.1 | 55 | 98 |