EKT 720 Assignment 2

1. The estimated regression line is:

Prop = 106.8509 + 0.7971 Income + 0.4954 Stand + 139.9591 Ratio + 133.0301 Double.

*β1* shows that the value of the property when all the variables are zero is R106850.90, which is the mean/expected value of the property.

*β2* shows that the value of the property, when there is a one unit increase in income, increases by R797.10, holding the other variables constant.

*β3* shows that the value of the property, when there is a one unit increase (in meters squared) in stand size, increases by R495.40, holding the other variables constant.

*β4* shows that the value of the property, when there is a one unit increase in the ratio of build area to stand area, increases by R139959.10, holding the other variables constant.

*β5* shows that the value of the property, if the house is a double story, increases by R133030.10, holding the other variables constant.

1. *R-squared=0.92702*

The value of R-squared shows that 92.70% of the value of property is explained by the variables.

*\*Adjusted R-squared=0.91535*

The adjusted R-squared takes into consideration the number of explanatory variables in the model.

1. H0: *β1= β2=…= β5=0* Ha: Not all the parameters are zero

Reject H0 if F-val > F critical value

F-value for the model=79.3921 F critical value= 2.76

A high F-value is an indication of a significant model. Therefore, reject H0. The model is significant.

1. H0: *β3*=0 Ha: *β3* is not zero

Reject H0 if t-value > t critical value

t-val = 11.5488 t critical value = 2.060

Therefore, reject H0. *β3* is significantly different from 0.

1. Confidence interval for *β4* is (23.7079 ; 256.2104). Since *β4=139.959* and falls within the interval, it is significant at a 10% level of significance.

**(B2 and B4)**

H0: *β2= β4=0* Ha: The parameters are not zero

Reject H0 if F-val > F critical value

F-value = 77.7370 F critical value = 2.54

Therefore, reject H0. *β2* and *β4* are jointly significant.

SAS Coding:

**data** a;

input income1 income2 house stand double prop;

\*\*income=income1+income2;

\*\*ratio=house/stand;

cards;

521.502 118.348 735.779 920.53 0 1215.86

14.116 457.801 413.522 690.15 0 917.67

308.237 205.341 567.238 903.11 1 1201.16

449.589 157.470 496.226 659.05 1 1099.73

47.286 555.871 414.292 769.92 0 1077.25

12.702 400.744 283.223 539.62 1 973.28

303.539 360.630 671.121 934.58 0 1206.01

325.548 369.610 284.473 707.85 0 1071.03

328.079 17.192 492.552 699.23 0 834.60

479.735 34.212 767.408 1097.32 0 1102.11

70.381 319.148 373.140 760.19 0 774.12

232.232 255.517 238.515 577.39 0 828.64

56.125 326.705 589.865 930.42 0 1020.10

510.569 36.773 461.059 920.65 0 1044.39

15.890 353.851 345.385 655.05 1 932.65

298.906 126.398 531.592 1093.24 0 1036.68

280.401 105.089 497.296 727.87 0 867.00

188.411 419.229 383.097 903.32 0 1114.49

11.004 462.602 351.969 575.44 0 833.46

408.952 119.757 650.882 950.26 0 1044.39

114.999 253.868 439.853 849.32 0 831.60

200.932 141.234 400.907 571.64 0 773.70

276.907 350.366 554.191 948.33 1 1273.24

271.076 109.235 734.862 970.72 1 1124.66

357.141 324.151 507.147 686.02 0 1146.86

74.029 403.535 372.881 520.79 0 836.79

112.752 195.755 550.987 1048.71 0 1023.95

189.496 273.100 400.458 550.31 0 834.02

283.516 395.697 445.404 600.35 0 1064.84

255.701 154.743 535.123 1078.51 0 1075.30

;

**run** ;

\*\*Assignment 2 coding\*\*;

**proc** **iml**;

use a;

read all into b;

n=nrow(b);

y=b[,**6**];

income=b[,**1**]+b[,**2**];

house=b[,**3**];

stand=b[,**4**];

double=b[,**5**];

ratio=house/stand;

x=j(n,**1**,**1**)||income||stand||ratio||double;

\*\*print x;

print 'Assignment 2a';

xpxinv=inv(x`\*x);

bhat=xpxinv\*x`\*y;

print bhat;

print 'Assignment 2b';

k=**5** /\*number of parameters(betas)\*/;

j=j(n,**1**,**1**)\*j(n,**1**,**1**)`;

ssto=y`\*y-(**1**/n)\*y`\*j\*y;

sse=y`\*y-bhat`\*x`\*y;

ssr=ssto-sse;

rsq=ssr/ssto;

radsq=**1**-((n-**1**)/(n-k))\*(sse/ssto);

print rsq, radsq;

print 'Assignment 2c';

msr=ssr/(k-**1**);

mse=sse/(n-k);

fsig=msr/mse;

print fsig;

print 'Assignment 2d';

covm=mse\*inv(x`\*x);

t\_b3=bhat[**3**,**1**]/covm[**3**,**3**]\*\*(**0.5**);

print t\_b3;

print 'Assignment 2e(i)';

uplim=bhat[**4**]+tinv(**0.95**,n-k)\*covm[**4**,**4**]\*\*(**0.5**);

lolim=bhat[**4**]-tinv(**0.95**,n-k)\*covm[**4**,**4**]\*\*(**0.5**);

print lolim uplim;

print 'Assignment 2e(ii)';

ybar=sum(y)/n;

p=**3** /\*number of parameters in restricted model\*/;

x\_res=x[,**1**]||x[,**3**]||x[,**5**];

bhat\_res=inv(x\_res`\*x\_res)\*x\_res`\*y;

yhat\_res=x\_res\*bhat\_res;

sse\_res=y`\*y-bhat\_res`\*x\_res`\*y;

\*\*ssr\_res1=ssq(yhat\_res-ybar);

rsq\_res=**1**-sse\_res/ssto;

\*\*rsq\_res1=ssr\_res1/ssto;

f\_res=((rsq - rsq\_res)/**2**)/((**1**-rsq)/(n-k));

print f\_res;

SAS Results

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| --- |
| Assignment 2a |

| **bhat** |
| --- |
| 106.85085 |
| 0.7970982 |
| 0.4954084 |
| 139.95912 |
| 133.03019 |

|  |
| --- |
| Assignment 2b |

| **rsq** |
| --- |
| 0.9270219 |

| **radsq** |
| --- |
| 0.9153454 |

|  |
| --- |
| Assignment 2c |

| **fsig** |
| --- |
| 79.392106 |

|  |
| --- |
| Assignment 2d |

| **t\_b3** |
| --- |
| 11.5488 |

|  |
| --- |
| Assignment 2e(i) |

| **lolim** | **uplim** |
| --- | --- |
| 23.707883 | 256.21035 |

|  |
| --- |
| Assignment 2e(ii) |

| **f\_res** |
| --- |
| 77.736974 |