Sr. No. ______

Date : ______

24/sep/17

ECON
Assignment - 4
Piyush Kulkarni
pxk161130

Q.5.5 a)

value = 28.4067 - 0.1834 Crime
- 22.8 lgNitox + 6.3715 Rooms
- 0.0478 Age - 1.3353 dist
+ 0.2723 Access - 0.0126 tax
- 1.1768 PT Ratio

Intercept → 28.4067 when all other attributes are zero, the value of house will be $28,406 which dosen't make any sense

Crime → -0.1834
when all other things kept constant one unit increase in per capita ~~price~~ crime decreases the value of house by $ 183.4

Nitox → -22.8 log → whe all other things kept c one ppm increase in concentration of Nitox decreases the value of house by $ 22,810.

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Rooms → 6.3715 → when all other things kept const one additional room in a dwelling will increase the value by $ 6,371

Dist → −1.3353 → when all things kept constant one unit increase in avg dist frm employment center will reduce the price by $ 1,335.

Age → −0.0478 → When all other things kept const, one unit increase in proportion of owner-occupied units built prior to 1940 will decrease the value by $47.8

Access → 0.2723 → — // —
— // — one additional unit in increase of ~~access~~ index of accessibility to radial high ways will increase price by $ 272.3

Tax → −0.0126 → — // —
one unit increase in full val. prop tax rate per $ 10,000 will decrease the value by $12.6.

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Pratio → -1.1768 → -1C

one unit increase in pupil-teacher ration by town will decrease the value by \$ 1,176.

b) β. Crime, $\beta_2 = -0.1833$

$t_{(0.975, 497)} = \pm 1.9647$

$\beta_2 = -0.1834 \pm 1.9647 \times 0.036$

$= \cancel{2.1481 \; 1.7813}$

$= \cancel{0.1116}$

$= -0.2551 \; \& \; -0.1116$

Access $\beta_2 = 0.2723, \; 0.0723$

$t_c = \pm 1.9647$

$= 0.1302 \; \& \; 0.4143$

c $\beta = 6.371$, $se = 0.3924$

$t_{stat} = \dfrac{6.371 - 7}{0.3924}$

$H_0: \beta = 7$

$H_1: \beta \neq 7$

$= -1.6029$

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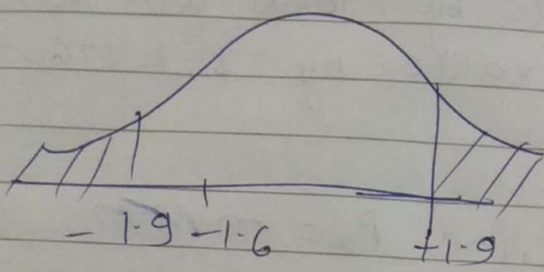
$t_{cri} = \pm 1.9647$



We fail to reject the null hyp that

increasing the no of rooms by one increases the value of house by \$7,000

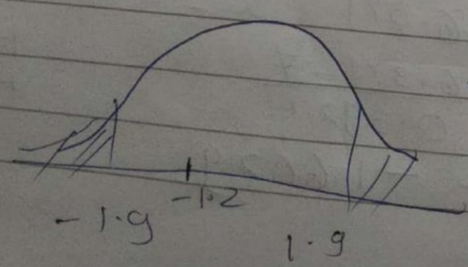
d) $\checkmark H_0 : \beta \geq -1$ $\quad$ $Se = 0.1394$

$H_1 : \beta < -1$ $\quad$ $\beta = -1.1768$

$$t_{stat} = \frac{-1.1768 - (-1)}{0.01394}$$

$$= -1.2682$$

$t_c = \pm 1.9647$



We fail to reject the null hypothesis. Incresing PT ratio will not increase value by \$10,000

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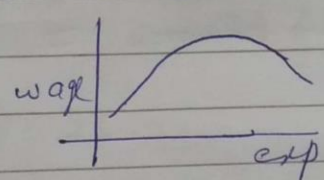
Q. 59

a) $\left.\dfrac{\partial(\text{Wage})}{\partial(\text{Exper})}\right| = \beta_3 + 2\beta_4 \text{ Exper}$

b) $\beta_2 \rightarrow +ve \rightarrow$ more education more wage

$\beta_3 \rightarrow +ve \rightarrow$ more experience, more wage

$\beta_4 \rightarrow -ve \rightarrow$ wages will start to decline after certain age as worker nears retirement



c) $\dfrac{\partial(\text{wage})}{\partial(\text{exper})} = \beta_3 + 2\beta_4 \text{ exper}$

wages decline when

$\beta_3 + 2\beta_4 \text{ exper} = 0$

$\text{expr} = \dfrac{-\beta_3}{2\beta_4}$

~~A~~ exp will start declining after it hits the maximum value

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d) $wage = \beta_1 + \beta_2 Edu + \beta_3 Exp + \beta_4 Exp^2$

i) $\frac{\partial(wage)}{\partial(Edu)} = \beta_2 = 2.2774$

$N = 1000$

$t_{c(0.975, 994)} = \pm 1.9623$

$se = 0.1394$

95% $CI = 2.274 \pm (1.9623 \times 0.1394)$

$= (2.0004 \; \& \; \cancel{2.2725} \; 2.5475)$

ii) $c\, exp = 4$

$\frac{\partial(wage)}{\partial(Exp)} = \beta_3 + 2\beta_4 Exp$

$= \beta_3 + 2 \times 4 \beta_4$

$= \beta_3 + 8\beta_4$

$CI = (\beta_3 + 8\beta_4) \pm t_{crit} \times se(\beta_3 + 8\beta_4)$

$se(\beta_3 + 8\beta_4) = \sqrt{var B_3 + 8^2 var B_4 + 2 \times 8 \, cov(\beta_3, \beta_4)}$

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$$= \sqrt{(0.1048)^2 + 64\times(0.0049)^2 + 16(-0.000189)}$$

$$= 0.09045$$

95% CI

$$= \cancel{0.6821 + 8\times 0.00}$$

$$= 0.6821 - 8\times 0.0101 \pm (1.9623\times 0.09045)$$

$$= 0.4238 \text{ \& } 0.7789$$

Exp = 25

iii) $(\beta_3 + 2\times 25\beta_4) \pm t_c \times Se$

$$= \cancel{0.6821 + 50\times 0.0101 \pm (1.9623\times 0.09045)}$$

$$Se = \sqrt{(0.1048)^2 + 50^2(0.0019)^2 + 100(-0.000189)}$$

$$= 0.03329$$

$$= (0.6821 - 50\times 0.0101) \pm (1.9623\times 0.03329)$$

$$= 0.1117 \text{ \& } 0.2424$$

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5.12

a) $\beta_2 \rightarrow$ negative
more the quantity, less the price.

$\beta_3 \rightarrow$ +ve
more the quality more the price

$\beta_4 \rightarrow$ positive or negative
~~It~~ trend could be +ve or -ve depending on other curcomestances

b)

Intercept	90.8466
quant	-0.0599
qual	0.1162 → pval not significant
trend	- 2.354

~~one gr wt~~
Holding all other things constant
→ one gram increase in quantity will decrease price by \$0.06 or 6 cents
→ one percent increase in quality will increase price by \$ 0.116 or 11.6 cents

→ one unit increase in trend will reduce price by \$2.35

Signs are as expected

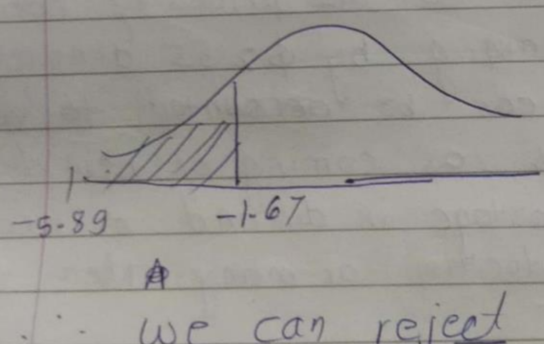
c) $R^2 = 0.509$
Adj $R^2 = 0.4814$

Roughly 48% variation in cocain price is explained by quantity quality, time

d) $H_0: \beta_2 \geq 0$
$H_1: \beta_2 < 0$

$t_{critical} = (t_{0.05, 52}) = -1.674$

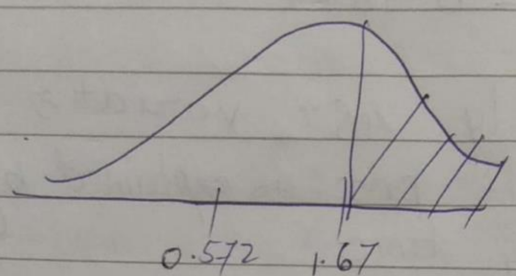
$t_{stat} = -5.89$ → from reg-output



∴ we can reject the null hypothesis that Higher the quantity higher the price

e) $H_0 : \beta_3 = 0$
$H_1 : \beta_3 > 0$

$t_c = -1.674$
$t_{stat} = 0.572$



We fail to reject the null hypothesis that no premium is paid ~~for~~ the high ~~value~~ quality of cocain

f) the parameter for treand is -2.354 so the price of cocain is changing by $2.35 annualy. this can be accounted to various factors as coming of new drugs, or shortage in dimand or excess in production or many other things

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5.13

a) Intercept -41947

sqft 90.90

age -755.041

Keep all other thing const

→ Intercept → price of house will be ~~$41~~ $-41947 with ~~no~~ zero sqft & age which don't make any sense

→ Sqft → every additional sqft will increase by $ ~~9~~ 90.90

→ Every one year addition in age will decrease price by $755.

b)

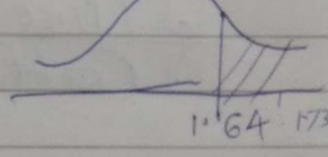
~~85~~

86.254 & 95.68

→ calculated using R

c) $H_0: \beta_3 \geq 1000$

$H_1: \beta_3 < -1000$ ✓



$t_{critical} = t(0.95, 1077) = \pm 1.6462$

$t_{stat} = \dfrac{-755 + 1000}{140.89} = \cancel{1.46}\ 1.73$

Signature

we fail to reject the null hypothesis that having a house a year older decreases price by 1000 or less

b)

$$Price = \beta_1 + \beta_2\, sqft + \beta_3\, Age + \beta_4\, sqft^2 + \beta_5\, Age^2$$

i)

$$\left.\frac{\partial(Price)}{\partial(sqft)}\right| = \beta_2 + 2\beta_4\, sqft$$

Max = 7897
Min = 662

$\beta_2 = -55.78$

$\beta_4 = 0.02315$

$$\frac{\partial(Price)}{\partial(sqft)}_{min} = -55.78 + 0.02315 \times 662$$

$$= -25.1294$$

$$\left.\frac{\partial(Price)}{\partial(sqft)}\right|_{max} = 309.85$$

$$\left.\frac{\partial(Price)}{\partial(sqft)}\right|_{2300} = 50.71$$

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~~for~~ smaller house change ~~of~~ sqft seems unrealistic but as size increases price also increases

ii) $\frac{\partial(\text{Price})}{\partial(\text{Age})} = \underset{-2798}{\beta_3} + 2\times \underset{30.16}{\beta_5}\, Age$

Max Age = 80 Min Age = 1

$\left.\frac{\partial(\text{Price})}{\partial(\text{Age})}\right|_{Min} = -2737.68$

$\left.\frac{\partial(\text{Price})}{\partial(\text{Age})}\right|_{max} = 2027.6$

$\left.\frac{\partial(\text{Price})}{\partial(\text{Age}}\right|_{20} = -1591.6$

The values seems ~~to~~ be unrealistic the older the house, lesser should be the price

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$sqft = 2300$

iii) $t_c = 1.9621$

$$Se = \sqrt{40.82 + \times (\overset{46}{\cancel{}}00)^2 \times 9.29 \times 10 - 2 \times 2300 \times 2 \times 0.0050}$$

$$= 2.544$$

$$C.I. = \beta_2 + 2\beta_4 \pm t_c \times Se$$

$$= \cancel{5.5}$$

$$= -55.78 + 2 \times 0.023 \times 2300 \pm 1.9621 \times 2.544$$

$$= 45.718 \ \& \ 55.70158$$

iv) $$\frac{\partial(Price)}{\partial(Age)} = b_3 + 2b_5 Age$$

$Age = 20$

$$Se = \sqrt{9.309 \times 10^4 + 2^2 \times 20^2 \times 25.7155 + 2 \times 2 \times 20(-1.4345 \times 10^3}$$

$$= 139.5521$$

$H_0: \frac{\partial(Price)}{\partial Age} \geq -1000$ $\qquad$ $H_1: \frac{\partial(Price)}{\partial(Age)} < -1000$

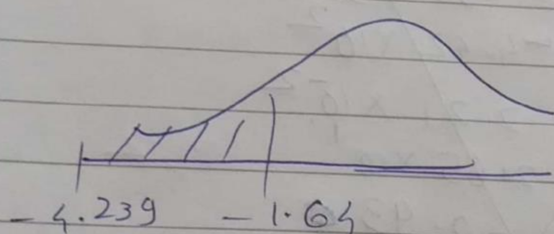
$$t_{stat} = \frac{(b_3 + 2b_5) - (-1000)}{se}$$

$$= \cancel{-2789}$$

$$= \frac{-2798 + 40 \times 30.16 + 1000}{139.5521}$$

$$= -4.239$$

$$t_c = -1.64$$



We ~~A~~ reject the null hypothesis that is for a 20 year old house, an extra year in ~~price~~ age decreses the price by is more than $1000.

c) $Price = 1.146\times10^{5} - 3.073\times10^{1}\, sqft - 4.42\times10^{2}\, age + 2.21\times10^{-2}\, sqft^{2} + 2.65\times10^{1}\, Age^{2} - 9.3\times10^{-1}\, sqft\times age$

i) $$\frac{\partial(Price)}{\partial(sqft)} = \beta_2 + 2\times\beta_3\, sqft + \beta_6\, Age$$

$Age = 20,\ sqft = 2300$

$\beta_2 = -30.73$

$\beta_3 = -4.42\times10^{2}$

$\beta_4 = 2.21\times10^{-2}$

$\beta_5 = 2.65\times10^{1}$

$\beta_6 = -0.93$

$$\frac{\partial(Price)}{\partial(sqft)} =$$

$Age\ 20,\ sqft = 2300$

$\beta_2 = -30.73$ sqft

$\beta_3 = -442$ Age

$\beta_4 = 2.218 \times 10^{-2}$ $sqft^2$

$\beta_5 = 26.52$ Age^2

$\beta_6 = -0.09306$ sqft × age

$$\frac{\partial(Price)}{\partial(sqft)} = -30.73 + 2 \times 2.218 \times 10^{-2} \times 2300 - 0.09306 \times 20$$

$$= 52.708$$

Age = 20, Min sqft = 662

$$\frac{\partial(Price)}{\partial(sqft)} = -19.975$$

Age = 20, biggest house = 7897

$$\frac{\partial(Price)}{\partial(sqft)} = 300.96$$

ii) effect of age & price

$$\frac{\partial(\text{Price})}{\partial(\text{Age})} = \beta_3 + 2\beta_5 \text{Age} + \beta_6 \text{sqft}$$

sqft = 2300 Age = 1

$$\frac{\partial(\text{Price})}{\partial(\text{Age})} = -2529.33$$

Age = 80, sqft = 2300

$$\frac{\partial(\text{Price})}{\partial(\text{Age})} = 1660.82$$

Age = 20, sqft = 2300

$$\frac{\partial(\text{Price})}{\partial(\text{Age})} = -1521.58$$

Newer the house less the price,
older the house more the price

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iii) $Sqft = 2300, \quad Age = 20$

$t_c = t(0.95, 1074) = 1.962$

$$\frac{\partial(Price)}{\partial(Sqft)} \pm t_c \, se\left(\frac{\partial Price}{\partial(Sqft)}\right)$$

from part i)

$$= 52.708 \pm (1.962 \times 2.4825)$$

$$= 47.84 \; \& \; 57.58$$

iv) ~~$H_0: \beta_4 \neq 4$~~

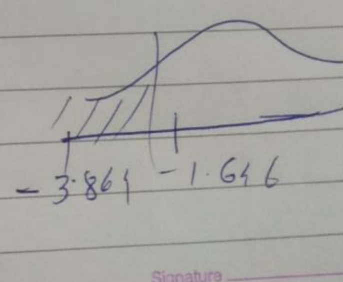
$H_0: \beta_3 + 40\beta_5 + 2300\beta_6 \geq -1000$

$H_1: \beta_4 + 40\beta_5 + 2300\beta_6 \leq -1000$

$$t_{stat} = \frac{b_4 + 40b_5 + 2300b_6 - (-1000)}{se(b_4 + 40b_5 + 2300b_6)}$$

$$t_{stat} = \frac{-5.21701}{13.60} = -3.846$$

$t_c = -1.646$



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we reject the null hypothesis that for house 20yr old price reduction is more than or equal to $1000.

d) The linear model is not sufficient ~~to~~ fit the data. the addition of quadratic term $sqft^2$ & age^2 increases the model fit. the further addition of the ~~term~~ interaction terme $age \times sqft$ increases the model fit. *

```
R version 3.2.5 (2016-04-14) -- "Very, Very Secure Dishes"
Copyright (C) 2016 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
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Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> qt(0.975,497)
[1] 1.964749
> qt(c(-0.1834,.975), df = 467)
[1]      NaN 1.965057
Warning message:
In qt(c(-0.1834, 0.975), df = 467) : NaNs produced
> a <- qt(0.975,497)
> -.1834+a
[1] 1.781349
> -.1834 - a
[1] -2.148149
> -.1834+ (a*0.0365)
[1] -0.1116867
> -.1834 - (a*0.0365)
[1] -0.2551133
> .2723 + (a*0.0723)
[1] 0.4143513
> .2723 - (a*0.0723)
[1] 0.1302487
> .2723 +- (a*0.0723)
[1] 0.1302487
> a <- qt(0.975,994)
> a
[1] 1.962353
> sqrt((.1048^2))
[1] 0.1048
> sqrt((.1048^2)+(64*.0019^2)+(16*-0.000189))
[1] 0.09049906
> 0.6821-(8*0.0101)+(1.9623*0.09045)
[1] 0.77879
> 0.6821-(8*0.0101)-(1.9623*0.09045)
[1] 0.42381
> 0.6821-(50*0.0101)-(1.9623*0.09045)
[1] -0.000390035
> sqrt((.1048^2)+(50^2*.0019^2)+(50*-0.000189))
[1] 0.1027523
> sqrt((.1048^2)+(50^2*.0019^2)+(100*-0.000189))
[1] 0.03328723
> 0.6821-(50*0.0101)+(1.9623*0.03329)
[1] 0.242425
> 0.6821-(50*0.0101)-(1.9623*0.03329)
[1] 0.111775
> sqrt((.10486^2)+(50^2*.0019^2)+(100*-0.000189))
[1] 0.03347566
> 0.6821-(8*.0101)+(1.96*23*.09045)
[1] 4.678786
```

```
> 0.6821-(8*.0101)+(1.9623*.09045)
[1] 0.77879
> 0.6821-(8*.0101)-(1.9623*.09045)
[1] 0.42381
> sqrt((.1048^2)+(50^2*.0019^2)+(100*-0.000189))
[1] 0.03328723
> sqrt((.1048^2)+(50^2*.0019^2)+(100*-0.000189259))
[1] 0.0328959
> sqrt((.1048^2)+(50^2*.0019^2)-(100*+0.000189259))
[1] 0.0328959
> 06821-(50*.0101)
[1] 6820.495
> 0.6821-(50*.0101)
[1] 0.1771
> .1771+(1.9623*.03329)
[1] 0.242425
> .1771-(1.9623*.03329)
[1] 0.111775
> library(haven)
> cocaine <- read_dta("D:/Class Notes/Fall 17 Classes/ECON/Data_sets/cocaine.dta")
> View(cocaine)
> model <- lm(price ~ quant qual trend, data = cocaine)
Error: unexpected symbol in "model <- lm(price ~ quant qual"
> model <- lm(price ~ quant +qual+ trend, data = cocaine)
> summary(model)

Call:
lm(formula = price ~ quant + qual + trend, data = cocaine)

Residuals:
    Min      1Q  Median      3Q     Max 
-43.479 -12.014  -3.743  13.969  43.753 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept) 90.84669    8.58025  10.588 1.39e-14 ***
quant       -0.05997    0.01018  -5.892 2.85e-07 ***
qual         0.11621    0.20326   0.572   0.5700    
trend       -2.35458    1.38612  -1.699   0.0954 .  
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 20.06 on 52 degrees of freedom
Multiple R-squared:  0.5097,	Adjusted R-squared:  0.4814 
F-statistic: 18.02 on 3 and 52 DF,  p-value: 3.806e-08

> qt(0.05,52)
[1] -1.674689
> library(haven)
> br2 <- read_dta("D:/Class Notes/Fall 17 Classes/ECON/Data_sets/br2.dta")
> View(br2)
> model <- lm(price ~ sqft + age, data = br2)
> summary(model)

Call:
lm(formula = price ~ sqft + age, data = br2)

Residuals:
    Min      1Q  Median      3Q     Max 
-358116  -33259   -6111   27242  936754 

Coefficients:
              Estimate Std. Error t value Pr(>|t|)    
(Intercept) -41947.696   6989.636  -6.001 2.67e-09 ***
```

```
sqft            90.970      2.403  37.855  < 2e-16 ***
age           -755.041    140.894  -5.359 1.02e-07 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 78810 on 1077 degrees of freedom
Multiple R-squared:  0.5896,   Adjusted R-squared:  0.5888
F-statistic: 773.6 on 2 and 1077 DF,  p-value: < 2.2e-16

> confint(model, sqft, level=095)
Error in confint.lm(model, sqft, level = 95) : object 'sqft' not found
> confint(model, 'sqft', level=095)
     -4700 % 4800 %
sqft     NaN    NaN
Warning message:
In qt(a, object$df.residual) : NaNs produced
> confint(model, 'sqft', level=0.95)
        2.5 %   97.5 %
sqft 86.25451 95.68509
> qt(.95,1077)
[1] 1.64627
> -755-1000
[1] -1755
> -17755/140.89
[1] -126.0203
> 1755/140.89
[1] 12.45653
> 1000-755
[1] 245
> 245/140.89
[1] 1.738945
```

```
> model <- lm(price ~ sqft + age + I(sqft*sqft) + I(age*age), data = br2)
> summary(model)

Call:
lm(formula = price ~ sqft + age + I(sqft * sqft) + I(age * age),
    data = br2)

Residuals:
    Min      1Q  Median      3Q     Max
-805011  -23873   -1375   18067  659703

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     1.701e+05  1.043e+04  16.310  < 2e-16 ***
sqft           -5.578e+01  6.389e+00  -8.731  < 2e-16 ***
age            -2.798e+03  3.051e+02  -9.170  < 2e-16 ***
I(sqft * sqft)  2.315e-02  9.642e-04  24.013  < 2e-16 ***
I(age * age)    3.016e+01  5.071e+00   5.948 3.68e-09 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 63370 on 1075 degrees of freedom
Multiple R-squared:  0.7352,   Adjusted R-squared:  0.7342
F-statistic:   746 on 4 and 1075 DF,  p-value: < 2.2e-16

> .02315-55.78
[1] -55.75685
> 2*.02315
[1] 0.0463
> -55.78
[1] -55.78
> 0.0463-.5578
```

```
[1] -0.5115
> max(br2$sqft)
[1] 7897
> min(br2$sqft)
[1] 662
> (.02315*662)-55.78
[1] -40.4547
> (.02315**2662)-55.78
[1] -55.78
> (.02315**2*662)-55.78
[1] -55.42522
> (.02315*2*662)-55.78
[1] -25.1294
> (.02315*2*7897)-55.78
[1] 309.8511
> (.02315*2*2300)-55.78
[1] 50.71
> max(br2$age)
[1] 80
> min(br2$age)
[1] 1
> (2*30.16)-2798
[1] -2737.68
> (2*30.16*80)-2798
[1] 2027.6
> (2*30.16-2798
+ min(br2$age)
Error: unexpected symbol in:
"(2*30.16-2798
min"
> (2*30.16)-2798
[1] -2737.68
> (2*30.16*20)-2798
[1] -1591.6
> qc(.972,1075)
Error: could not find function "qc"
> qt(.972,1075)
[1] 1.913105
> qt(.975,1075)
[1] 1.962173
> vcov(model)
                  (Intercept)          sqft           age I(sqft * sqft)  I(age * age)
(Intercept)     1.088320e+08 -6.110570e+04 -1.340396e+06   8.152671e+00  1.601762e+04
sqft           -6.110570e+04  4.082499e+01  3.205761e+02  -5.870334e-03 -3.547411e+00
age            -1.340396e+06  3.205761e+02  9.309548e+04  -3.955193e-02 -1.434561e+03
I(sqft * sqft)  8.152671e+00 -5.870334e-03 -3.955193e-02   9.296015e-07  4.459434e-04
I(age * age)    1.601762e+04 -3.547411e+00 -1.434561e+03   4.459434e-04  2.571554e+01
> 23*10^2
[1] 2300
> 23*10^-2
[1] 0.23
> sqrt(40.82+((4600^2)*(9.29*10^-7))+(2*2300*2*5.87*10^-3))
[1] 10.69961
> sqrt(40.82+((4600^2)*(9.29*10^-7))-(2*2300*2*5.87*10^-3))
[1] 2.544335
> -55.78+(2*.023*2300)+(1.9621*2.544)
[1] 55.01158
> -55.78+(2*.023*2300)-(1.9621*2.544)
[1] 45.02842
> -55.78+(2*.02315*2300)-(1.9621*2.544)
[1] 45.71842
> -55.78+(2*.02315*2300)+(1.9621*2.544)
[1] 55.70158
> sqrt((9.309*10^4)+(4*400*25.7155)-(80*1.4345*10^3))
[1] 139.5521
> ((40*30.16)+1000-2798)/139.5521
[1] -4.239277
> qt(.95,1075)
[1] 1.646272
> model <- lm(price ~ sqft+ age + I(sqft * sqft) + I(age * age) + I(sqft * age), data= br2)
> summary(model)
```

```
Call:
lm(formula = price ~ sqft + age + I(sqft * sqft) + I(age * age) +
    I(sqft * age), data = br2)

Residuals:
    Min      1Q  Median      3Q     Max
-796617  -21537    -439   17825  623609

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     1.146e+05  1.214e+04   9.437  < 2e-16 ***
sqft           -3.073e+01  6.898e+00  -4.455 9.27e-06 ***
age            -4.420e+02  4.106e+02  -1.077    0.282
I(sqft * sqft)  2.218e-02  9.425e-04  23.537  < 2e-16 ***
I(age * age)    2.652e+01  4.939e+00   5.370 9.66e-08 ***
I(sqft * age)  -9.306e-01  1.124e-01  -8.277 3.72e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 61470 on 1074 degrees of freedom
Multiple R-squared:  0.751,    Adjusted R-squared:  0.7499
F-statistic:   648 on 5 and 1074 DF,  p-value: < 2.2e-16

> -30.73+(2*2.218*10^-2*2300)-(.09306*20)
[1] 69.4368
> -30.73+(2*0.02218**2300)-(.09306*20)
[1] -32.5912
> -30.73+(2*0.02218*2300)-(.09306*20)
[1] 69.4368
> -30.73+(2*0.02218*662)-(.09306*20)
[1] -3.22488
> -30.73+(2*0.02218*662)-(.9306*20)
[1] -19.97568
> -30.73+(2*0.02218*2300)-(.9306*20)
[1] 52.686
> -30.73+(2*0.02218*662)-(.9306*20)
[1] -19.97568
> -30.73+(2*0.02218*7897)-(.9306*20)
[1] 300.9689
> -420+(2*26.52*1)-(0.9306*2300)
[1] -2507.34
> -442+(2*26.52*1)-(0.9306*2300)
[1] -2529.34
> -442+(2*26.52*80)-(0.9306*2300)
[1] 1660.82
> -442+(2*26.52*20)-(0.9306*2300)
[1] -1521.58
> vcov(model)
                 (Intercept)          sqft           age I(sqft * sqft)  I(age * age) I(sqft *
(Intercept)     1.474488e+08 -7.781252e+04 -3.171479e+06   8.456068e+00  1.802396e+04  7.546407
sqft           -7.781252e+04  4.757635e+01  1.163214e+03  -5.877578e-03 -4.669568e+00 -3.403597
age            -3.171479e+06  1.163214e+03  1.686025e+05  -7.050846e-02 -1.475013e+03 -3.200138
I(sqft * sqft)  8.456068e+00 -5.877578e-03 -7.050846e-02   8.883579e-07  4.710565e-04  1.315232
I(age * age)    1.802396e+04 -4.669568e+00 -1.475013e+03   4.710565e-04  2.438964e+01  4.946518
I(sqft * age)   7.546407e+02 -3.403597e-01 -3.200138e+01   1.315232e-05  4.946518e-02  1.264187


>
```