Assignment #3 _ Econometrics

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Question 3.2

a)

Y-Intercept is 3.204 Rating. This means that at 0 years of experience you are slightly below average employee. As ratings go from 1-7.

b)

RATING = 3.204 + 0.076 EXPER ðse 0.709 .044Þ

confidence interval for B2

B2 + t-value * Standard error(b2)

B2 - t-value * Standard error(b2)

T value at N=24 -2 = 22 at 0.975 is 2.074

0.076 + (2.074) *0.044 = 0.076 + 0.09125 = 0.167

0.076 - (2.074) *0.044 = 0.076 – 0.09125 = -0.01525

[-0.01525 ,0.167]

c) t= B2/standard error of B2

t = 0.076 / 0.044 = 1.727

From the T table at 0.975 with 22 degrees of freedom the t value is 2.074

Since t = 1.727 < 2.074, we do not reject the null hypothesis

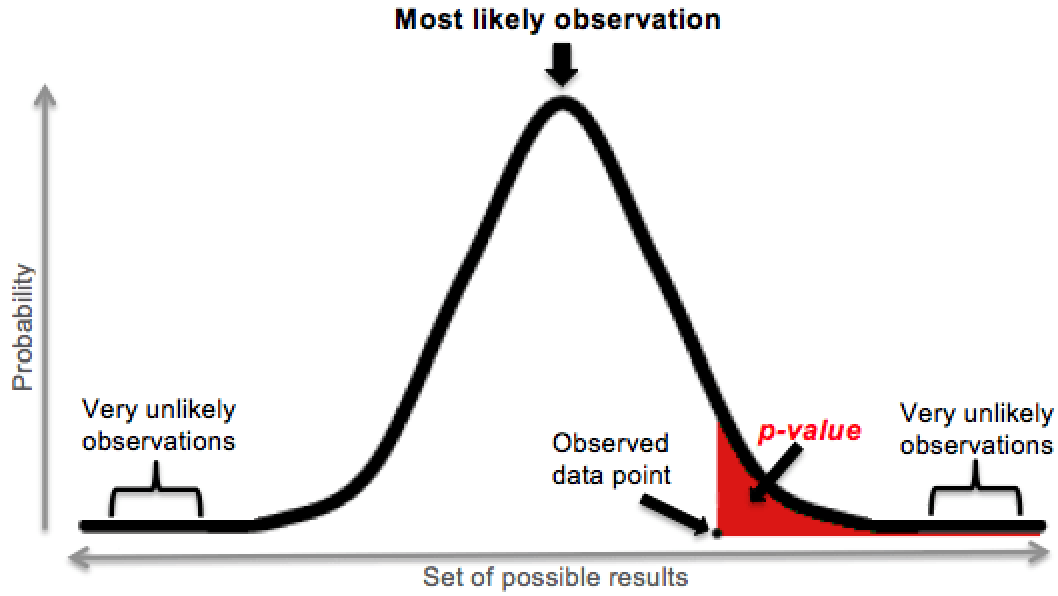
d) t= B2/standard error of B2

t = 0.076 / 0.044 = 1.727

From the T table at 0.95 with 22 degrees of freedom the t value is 1.717

Since $t = 1.727 > 1.717$, we reject the null hypothesis that $\beta_2 = 0$ and accept the alternative that $\beta_2 > 0$

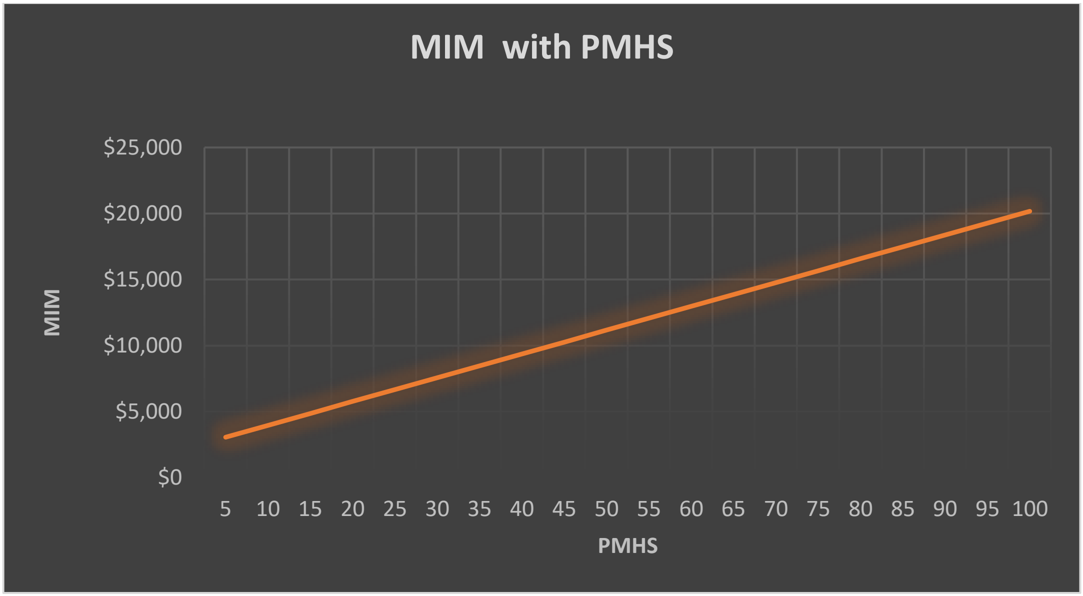
e) p-value is 0.0982 and alpha is 0.05.
In the above case we cannot reject the null hypothesis. As P value in c) is more than the value of alpha chosen. Show, in a diagram, how this p-value is computed.



A *p-value* (shaded red area) is the probability of an observed (or more extreme) result arising by chance

<u>Question 3.4</u>

a) t= B1/standard error of B1
1.257 = b1 / 2.174
B1 = 2.73
MIM = 2.73 + 0.18*PMHS



For convenience I changed the MIM into $1000.

b) t= B2/standard error of B2
5.754 = 0.18 / S error
S error = 0.18/5.754 = 0.0312

c) T value for B1 is 1.257
HO = B1 is 0
Hk = B1 is not equal to o

There are 51 observations so 49 degrees of freedom

R function `p.value(1.257,49)`

P VALUE IS 0.214

Function by default gives P value for two tailed Test

d) The slope means that for every percent increase in PMHS the median income of the state should increase by 0.18 or 0.18*1000 = $180. This makes sense as in economics it is widely believed that education increases your chances of good income.

e) confidence interval for B2
B2 + t-value * Standard error(b2)
B2 - t-value * Standard error(b2)
T value at N=51 -2 = 49 at 0.995 is 2.678

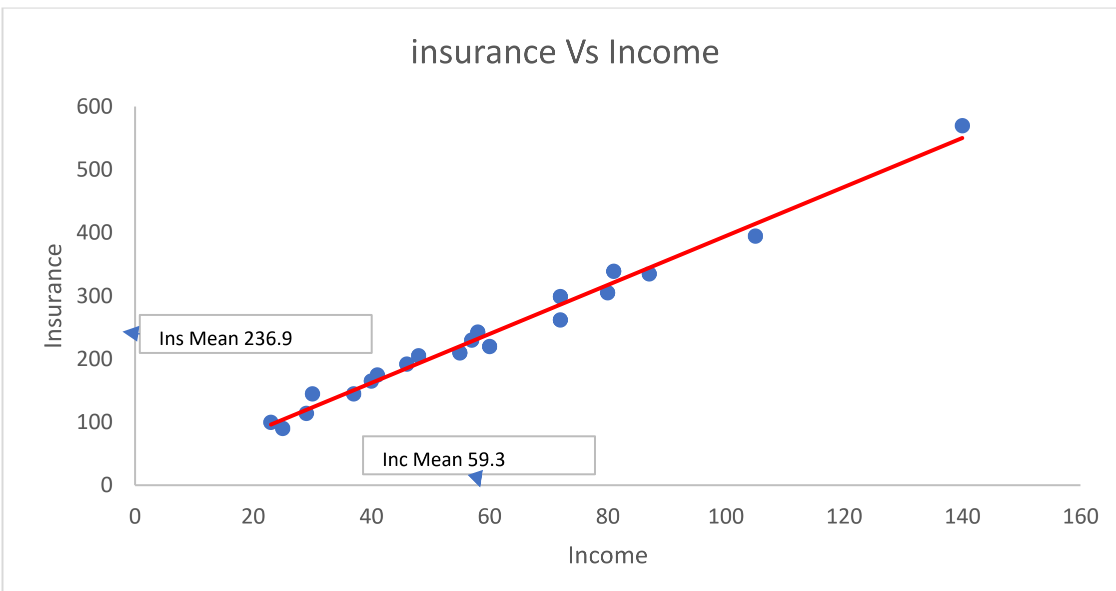
0.18 + (2.678)*0.0312= 0.18 + 0.0835 = 0.2635
0.18 - (2.678)*0.0312 = 0.18 - 0.0835 = 0.0965
[0.0965 ,0.2635]
f) H0 → B2 =0.2
Hk -→ B2 is not 0.2
T= b2-Hk /s error
T= 0.18 -0.2 / 0.0312 = -0.641

Critical value at 0.975 with 49 degrees of freedom is 2.009 or -2.009

we cannot reject Null hypothesis.

Question 3.5 (p. 120)

a)



Insurance = 6.85 + 3.88*INCOME
T -value 0.928 34.606
St error 7.38 0.112

b) This means that every $1000 increase in Income will increase Insurance by $3880

Standard error in this relationship is 0.112. This can be used to find the confidence interval as formula for confidence interval is B2+/- (ST err)*Tvlaue

We can choose the t value based on our hypothesis and alpha value.

c) Ho → B2 =5
Hk -→ B2 is not equal 5

T -value = 3.88 -5 /0.112 = -9.99

From T table the critical value at 20 sample with alpha = 5% (two tail test)

T (0.975, 18 degrees of freedom) = 2.101 or -2.101

We reject the null hypothesis because -2.101 is more than -9.99 so null hypothesis

d) Ho → B2 = 1
Hk -→ B2 is not equal 1

T -value = 3.88 -1/0.112 = 25.714

From T table the critical value at 20 sample with alpha = 5% (two tail test)

T (0.975, 18 degrees of freedom) = 2.101

T -value is more than 2.101. Which is 25.714 > 2.101

This means we can reject Null Hypothesis of Ho → B2 = 1

e)

This concludes that higher the Income the more Customers will spend on Life insurance. To be precise it is expected that $1000 increase in Income will increase spending on Life Insurance by $3880.

Target audience should be population with more than Mean Income which is $59,300. This can really increase company's profitability as it translates to

Company should not aggressively approach or spend marketing resources on population with low income. To spend marketing budget appropriately company should only focus on population that has income more than $6880 + Standard error. That is $6880+ 7380 = $14,260

Company should organize special events and promotions for population with more than $100,000 Income. As they can spend $395,000 on Life Insurance and will give immediate boost to Company's revenue.

Regression Model conveys a very strong and Linear relationship between Spending on Life Insurance and Income. This can be trusted as standard error is very low for the parameter that defines the relationship between income and insurance spending. Moreover, P value for the parameter that defines the relationship between income and insurance spending is very low. This conveys that probability of being wrong is very low and company can base their imperative decisions on this model as it can be trusted.

Question 3.7 (p. 121)

a) N= 132 and degrees of freedom = 132-2 = 130

Ho → B2=1
Hk → B2 is not equal to 1

Critical value of T at alpha 5% is t (0.975, 130 degrees of freedom) = 1.960

Stock	Dis	GE	GM	IBM	MSFT	XOM
B2 /slope	0.897	0.899	1.261	1.188	1.318	0.413
St Error	0.123	0.09	0.202	0.126	0.160	0.0089
T value	-0.826	-1.01	1.292	1.49	1.987	-6.544
Comments	Cannot reject HO	CANNOT reject HO	Cannot reject HO	Cannot Reject HO	Reject HO	Reject HO

Analysis reveals that all
The closer the beta is to 1 the more aggressive the stock is.

b)

Ho = Beta is greater or equal to 1
Hk = Beta value is 1 or less than 1

At alpha= 5% and 130 degrees of freedom the Critical value of T is 1.645

Hk : B2 < c so critical value of T will be negative

Ho t value = B2-c / St error(B2)
(0.461 – 1)/0.0886 = -6.083

-1.645 is more than -6.083 meaning that HO can be rejected

Beta less than 1 means that stock is defensive and stable

c)

MSFT beta value is 1.318
Standard error = 0.160
HO → Beta is less than 1
Hk → Beta is more than 1

At alpha 5% the critical value of T (0.950, 130 degrees of freedom) = 1.645

Ho t value = B2-c / St error(B2)
T value at Ho = (1.318 -1)/0.160 = 1.987

T value for Ho is higher than t critical value of 1.645. Meaning we can reject Null Hypothesis.

Beta value 1 means stock is highly aggressive

d)
95% confidence interval for MSFT

t = 1.98

se = 0.16

Range of β = β ± (t*se)

Range of β = 1.31 ± (1.98*0.16)

β = [1.0005,1.63]

As a stock broker I will classify MSFT as risky stock with high risk to reward ratio. I would advise that investing in MSFT means great rewards but it can also mean great losses.

e)

Ho : Intercept is 0
Hk: Intercept is not 0

At 5% alpha. With 120 degrees of freedom the critical value is 1.96 or -1.96

Stock	**Disney**	**GE**	**GM**	**IBM**	**MSFT**	**XOM**
Intercept	-.0011	-0.0011	-0.01155	0.005	0.0060	0.0078
St Error	0.0059	0.0047	0.0097	0.0060	0.0077	0.00432
T values	-0.19	-0.24	-1.185	0.960	0.787	1.823
Comments	Cannot reject HO	CANNOT reject HO	Cannot reject HO	Cannot reject HO	Cannot reject HO	Cannot reject HO

This shows that the given data supports the financial theory of zero intercept.

Question 3.9 (p.122)

a)

There were 25 OBSERVATIONS so 23 degrees of freedom.

Data taken from 1916 to 2008

VOTE = 50.84 + 0.885*GROWTH

For this Ho → B2 =0
And Hk → B2 >0

I chose this as the alternative hypothesis because we are only interested in alternative if there is a positive relationship

At 5% alpha the critical value for t (0.950, 23) = 1.714

T VALUE FOR B2 according to regression is 4.87

Null hypothesis can be rejected as 4.87 > 1.714

b)

95% interval t(0.975,23)= 2.069

B2+ T critical value * Se

Se = 0.181

0.885 + 2.069*0.181 = 1.259

B2 - T critical value * Se

0.885 – 2.069*0.181 = -0.510

[0.510 ,1.259]

There is a 95% chance that B2 will be in the aforementioned range.

C)

25 observation form 1916 – 2008 and 23 degrees of freedom
VOTE = 53.40 – 0.444*INFLATION

T VALUE FOR B2 = -0.740

Ho → B2=0

Hk → B2<0

I chose this as my alterative hypothesis because we are only interested in negative reaction of Inflation. As Inflation is considered negative (or bad) for economy so its impact on voting is expected to be negative.

Critical value of T = t(0.95, 23) = 1.714

Since its Hk < C so it will be -1.714

Because -0.740 is more than -1.714 so HO CANNOT be rejected

d)

95% interval t(0.975,22)= 2.069

B2+ T critical value * Se

Se = 0.5999

-0.444 + 2.069*0..5999 = 0.797

B2 - T critical value * Se

-.0444 – 2.069*0.5999 = - 1.6833

[-1.6833 ,0.797]

e.)

given, Inflation = 0

with Inflation 0 Vote is B1

HO is B1 >= 50

HK is B1 < 50

I chose this as the alternative hypothesis to show that at 0 inflation economy might be stagnate and vote will go down as a result of that.

t = (53.407 – 50)/2.25

t = 1.51

$t_c = t_{0.95,22} = 1.71$

1.51 is less than the t critical so Null hypothesis cannot be rejected.

f) 95% confidence interval AT 2% INFLATION IS

(B1+2*B2) +/- SE(B1+2*B2) * T critical

T critical (0.975, 22) = 2.074

SE for B1 2.24999

SE for B2 0.599928

$var(\beta_1 + \beta_2*2) = var(\beta_1) + 4\ var(\beta_2) + 4cov(\beta_1 , \beta_2)$

$var(\beta_1 + \beta_2*2) = (se\ \beta_1)^2 + 4(se\ \beta_2) +4 * (-1.0592)$

$var(\beta_1 + \beta_2*2) = 2.26$

$se(\beta_1 + \beta_2*2) = sqrt(2.26)$

$se(\beta_1 + \beta_2*2) = 1.50$

(53.4 + 2* -.0444) +/- (SE(B1+2B2)) *2.069

Range = [49.40, 55.64]

*****************************CODE FOR ASSINGMENT******* ALL CODE COMES FROM R STUDIO VERSION 3.0 **

######################### Code for **P 3.5**

```
table <- read.dta13("insur.dta") #Saving the data from the file to a table

model <- lm(insurance~income,data=table)

summary(model)
```

```
# Call:
#   lm(formula = insurance ~ income, data = table)
#
# Residuals:
#   Min      1Q  Median      3Q     Max
# -24.228 -10.766   2.456  11.295  21.739
#
# Coefficients:
#             Estimate   Std.Error t value Pr(>|t|)
# (Intercept)   6.8550     7.3835   0.928    0.365
# income       3.8802     0.1121  34.606   <2e-16 ***
#   ---
#   Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#
# Residual standard error: 14.36 on 18 degrees of freedom
# Multiple R-squared:  0.9852,    Adjusted R-squared:  0.9844
# F-statistic:  1198 on 1 and 18 DF,  p-value: < 2.2e-16

predictYlm <- predict(model)



plot(table$income,table$insurance, xlab = "Income", ylab = "Insurance", type = "p")
lines(table$income,predictYlm,type="l")
```

##############CODE FOR 3.7

```
table <- read.dta13("capm4.dta")
table$date <- as.Date(as.character(table$date), "%Y%m%d")
```

```
rows <- length(colnames(table)) - 3 #Number of Companies

estimateTable <- matrix(ncol=5, nrow=rows)


for(i in 2:7)

{

  y      <- table[,i] - table$riskfree

  x      <- table$mkt - table$riskfree

  model   <- lm(y~x, data=table)

  b1      <- model$coefficients[1]

  b2      <- model$coefficients[2]

  seb1 <- coef(summary(model))[1, 2]

  seb2 <- coef(summary(model))[2, 2]

  estimateTable[i-1,] <- c(colnames(table[i]),b1,seb1,b2,seb2)

}

colnames(estimateTable) <- c("Company","Intercept","Std Error Inctercept","Slope","Std Error Slope")

estimateTable <- data.frame(estimateTable)

#Output Table
```

Company	Intercept	Std.Error.Inctercept	Slope	Std.Error.Slope
dis	-0.001149409	0.005956243	0.897838107	0.123626977
ge	-0.001166933	0.004759216	0.899259929	0.09878165
gm	-0.011550019	0.009742952	1.2614107	0.202223395
ibm	0.005851259	0.006091422	1.188208351	0.126432744
msft	0.00609752	0.007746733	1.318946814	0.160790142
xom	0.007880145	0.004322308	0.413968951	0.089713249

```
#Taking the output in an excel file

write.table(estimateTable,file="CAPM.xls")
```

CODE FOR 3.9

```
table <- read.dta13("fair4.dta")

subsetTable <- subset(table, year>1915)


#Using the linear model library to calculate the slope and intercept estimate

model <- lm(vote~growth, data=subsetTable)

summary(model)


# Call:

#   lm(formula = vote ~ growth, data = subsetTable)

#

# Residuals:

#   Min     1Q Median     3Q    Max

# -6.866 -3.334 -1.003  3.004 10.826

#

# Coefficients:

#   Estimate Std. Error t value Pr(>|t|)

# (Intercept)  50.8484     1.0125  50.218  < 2e-16 ***

#   growth       0.8859     0.1819   4.871  7.2e-05 ***

#   ---

#   Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

#

# Residual standard error: 4.798 on 22 degrees of freedom

# Multiple R-squared:  0.5189,	Adjusted R-squared:  0.497

# F-statistic: 23.73 on 1 and 22 DF,  p-value: 7.199e-05
```

```
#Using the linear model library to calculate the slope and intercept estimate

model <- lm(vote~inflation, data=subsetTable)

summary(model)


# Call:

#   lm(formula = vote ~ inflation, data = subsetTable)

#

# Residuals:
```