Week 2 – Homework

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Please see the attached word document for the Homework.

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Please note all homework is due submitted on-line by 1PM CST (Dallas) on Wednesday September 13.

For now, send me an email to [cmaybin@smu.edu](mailto:cmaybin@smu.edu) titled MSDS\_8310 - [Last Name] - Week 2 Homework. For example, my submission would be titled MSDS\_8310 - Maybin - Week 2 Homework. In the email should be the following (2) attachments containing the answers to the questions below:

* 1 Word document: Questions 1, 2, 3, 4, 6
* 1 R File: Question 5

Please keep all written answers short – say no more than 4 sentences.

Note: Breakout of the In class assignment is at the end of this homework.

Regards,

Chad

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Homework Section

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Question 1 – Given the following:

An individual has $1M dollars to invest and makes a salary of $150K per year. The money can be invested at 10% (for an annual return of $100K). The Individual has the option to: (A) Invest all the capital into the market and continue their salaried job, (B) Use all the $1M to open a restaurant which will have revenues of $600K and Costs of $300K or (C) Use all the $1M to open a hotel which will have revenues of $800K and costs of $550K.

1. Calculate the accounting profit for each scenario (include salary as profit for this example).

|  |  |
| --- | --- |
|  | Accounting profit |
| A - invest all in market and continue working | $ 250,000 |
| B- Invest all $ into restaurant and | $ 300,000 |
| C- hotel | $ 350,000 |

1. Calculate the economic profit of: (A) vs (B), (A) vs (C) and (B) vs (C)

|  |  |
| --- | --- |
|  | Economic profit |
| A-B | $ 50,000 |
| A-C | $ 100,000 |
| B-C | $ 50,000 |

1. From the perspective of opportunity cost, which is the best option?

The best option is to do option C over option A. In this case, option C has a $100K economic profit over option A. It is also worthwhile to note that option C has an economic profit that is $50K above the economic profit of B. So C is the best among the alternatives and the baseline.

Question 2 – in finance, what is the “rule of 72”? How many years will it take to double an investment with an annual compounded return of 7.2%? The rule of 72 is the rule that says given a rate of return, if we divide 72 by that rate it gives a simplified “rule of thumb” to determine the time it takes to double that investment. With a 7.2% annual rate of return, it will take approximately 10 years to double the initial investment.

Question 3 – Given the price of an equity (i.e. stock on a given stock market) is subject to the laws of supply and demand…(keep your answers at a high level)

1. What causes a change along the demand curve? For an equity, such as a stock, the only thing that causes movement along the curve is a change in price.
2. What causes a change OF the demand curve? A shift in the demand curve for a stock could be caused by a change in tastes and preferences for a company’s product that is either positive or negative to the bottom line of the company, hence causing a shift of the curve. Additionally, a material change in the way that a company does business, a change in leadership of the company, or an acquisition could shift the demand curve for a stock. Additionally, if the consumers of the product that a company produces experience a rise or fall in income, we could see demand for the equity representing the firm shift. Lastly, a change in the prices of a compliment or substitute for a good that a firm produces could represent an opportunity for a curve shift in the demand for the equity representing the business as well

Question 4 – Given the time value of money and the interplay of supply and demand…(again, keep your answers at a high level)

1. What is inflation? Inflation is the general rate at which the prices of goods and services rises over time
2. What is deflation? Deflation is a general rate of decline in the prices of goods and services that can be indicative of a poor economy or an imbalance of demand.
3. Under which of these two scenrios (all other things being equal), are consumers more likely to spend today versus tomorrow? Consumers are more likely to spend today versus tomorrow under the scenario of deflation since their dollars today are generally worth more than their dollars tomorrow all else equal.

Question 5 – In R code, create a number sorting algorithm (using recursion) which sorts numbers from highest to lowest. Generate a random string of 10 numbers between 1 and 100 and feed this into your function. An excellent example of this is located at:

<http://www.jason-french.com/blog/2014/07/26/recursion-in-r/>.

Make sure you give credit if you use this code….

Question 6 – Run the code below and answer the following questions:

1. What is the code section “confint(jour\_lm, level = 0.99)” doing? Why is it telling us and why does it matter? This code outputs the confidence intervals of the intercept and the coefficients of the regression model. These values tell us that 99% of the time the ranges given by the output will contain the actual population mean of the regression model coefficients.
2. What is the code section “linearHypothesis(jour\_lm, "log(citeprice) = -0.5")” doing? Why convert to log? This section is actually running an F-test on a specified hypothesis of the value for the output of the regression. In this case, we are calculating the log for a couple of reasons. First, that is what we fed into the model, so it makes sense that we would have to replicate these values. Second, this model was seeking to evaluate the elasticity and taking the log of price actually creates an elasticity value.

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# MSDS Week 2 Class Practical Learning

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#as seen in Chapter 3 of textbook

#Code sourced from textbook –

#Kleiber, Christian; Zeileis, Achim. Applied Econometrics with R. Springer New York. Kindle Edition.

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# Simple Linear Regression

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

install.packages("AER")

library("AER")

rm(list = ls())

gc()

par(mfrow=c(1,1))

data("Journals")

journals <- Journals[, c("subs", "price")]

journals$citeprice <- Journals$price/Journals$citations

summary(journals)

plot(log(subs) ~ log(citeprice), data = journals)

jour\_lm <- lm(log(subs) ~ log(citeprice), data = journals)

abline(jour\_lm)

class(jour\_lm)

names(jour\_lm)

summary (jour\_lm)

jour\_slm <- summary(jour\_lm)

class(jour\_slm)

names(jour\_slm)

jour\_slm$coefficients

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# Analysis of Variance

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

anova(jour\_lm)

coef(jour\_lm)

confint(jour\_lm)

confint(jour\_lm, level = 0.99)

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# Prediction

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

predict(jour\_lm, newdata = data.frame(citeprice = 2.11), interval = "confidence")

predict(jour\_lm, newdata = data.frame(citeprice = 2.11), interval = "prediction")

lciteprice <- seq(from = -6, to = 4, by = 0.25)

jour\_pred <- predict(jour\_lm, interval = "prediction", newdata = data.frame(citeprice = exp(lciteprice)))

plot(log(subs) ~ log(citeprice), data = journals)

lines(jour\_pred[, 1] ~ lciteprice, col = 1)

lines(jour\_pred[, 2] ~ lciteprice, col = 1, lty = 2)

lines(jour\_pred[, 3] ~ lciteprice, col = 1, lty = 2)

par(mfrow = c(2, 2))

plot(jour\_lm)

par(mfrow = c(1, 1))

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# Testing Linear Hypothesis

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linearHypothesis(jour\_lm, "log(citeprice) = -0.5")

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# End of Week 2

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# In Class Exercise

#\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# Function is demand: P= 12400000 - QD

#becomes given the facts in the problem QD = 12,400,000 - Pfactorial

#Code broken out as much as reasonably possible...

#Code adapted from www.programiz.com

#https://www.programiz.com/r-programming/recursion

#First, let's clean up the global environment

rm(list = ls())

gc()

par(mfrow=c(1,1))

#next let's create the demand function

demand.recursive <- function(P=8) {

#terminating condition

if (P==0) return (1)

#recursive condition

else return(P \* demand.recursive(P-1))

}

#Build a list of the recursive values...

demand.recursive()

ListRecursive <- demand.recursive()

ListRecursive <- c(ListRecursive, demand.recursive(10))

ListRecursive <- c(ListRecursive, demand.recursive(11))

Demand <- function(Baseline = 12400000, P=8) {

return (Baseline - demand.recursive(P))

}

#Let's test to make sure it works as expected...building a list...

ListDemand <- Demand()

Demand(12400000,9)

ListDemand <- c(ListDemand, Demand(12400000,9))

ListDemand <- c(ListDemand, Demand(12400000,10))

ListDemand <- c(ListDemand, Demand(12400000,11))

#create iterative values

iter= 1:14

#create vector

ListDemand<- vector("list",0)

#iterate through values...

for (i in iter){

ListDemand <- c(ListDemand, Demand(12400000,i))

}

#Let's see what we have...

ListDemand

#Put values into a data frame...

listofDemand <- do.call(rbind.data.frame, ListDemand)

listofDemand$Price <- iter

colnames(listofDemand) <- c("Demand","Price")

#keep it simple and reorder the dataframe...

listofDemand<- listofDemand[c(2,1)]

#and plot...not really useful given the values, but easy to see where it hits zero...

#plot(listofDemand)

plot (log(listofDemand$Demand))