PPPA 6007: Microeconomics for Public Policy I
Fall 2020

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Use Numbers: Assignment 1 of 3
Equilibrium Prices, Supply and Demand

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Due September 29, 2020

In class, we have learned that the price we observe in the market is the equilibrium price. This equilibrium price is influenced by both supply and demand.

In this assignment, we ask you to look at a time series of an equilibrium price (time series means data over time) and pick out some large movements (big changes) in that price. Are those changes due to supply or demand?

We are going to focus on oil price data, and you can find the data files here: [csv], [xls], [rds]. These are all the same data, just in different formats.

These oil price data come from FRED, the St. Louis Federal Reserve Bank's data warehouse. Specifically, we are looking at the spot price of one barrel of West Texas Intermediate crude oil, which is the type of oil produced in Texas.[1]

Google and news archives should be sufficient to answer these questions. This is not a major research paper, so please scale your effort accordingly.

While we expect your to rely on outside sources, any phrase of more than two words from another source should have quotes around it and a citation (any format is fine). If we detect plagiarism (see here if you are uncertain what this means) you will get a zero on this assignment and may face additional consequences depending on the severity of your actions.

You are welcome to discuss parts of this assignment with other students. However, any work you turn in must be your own and written in your own words.

To make graphs, you can use Excel, R (instructions at the end; I suggest this only if you have time to invest) or the software of your choice. We can support technical questions in Excel or R (Brooks and Bayar only).

# 1 Questions

1. Graph the price of WTI over time, for all years in the data.

2. Find the average oil price in each decade. Looking at the average price across decades, one decade stands out from the overall pattern (do not include the current decade, which is still too

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[1]While the FRED data are nominal (not adjusted for inflation), the dataset you have is already in real dollars. "Real dollars" means dollars corrected for inflation. Intuitively, this means that a dollar purchases the same amount over time. If you are curious, we use this series to deflate the prices.

short to consider!). Write a brief paragraph giving at least one reason that this decade was anomalous. Explain whether your reason is supply or demand.

3. Pick out two large price changes from the graph you made for question 1. By "large price change," I mean a period where the line is steeply sloped, which is when the price rises or falls quickly. (The data are monthly, but these changes need not be monthly.) What drove these changes? Identify whether they are driven primarily by supply or demand. If you can't differentiate between supply and demand in the price change, choose another price change. Write one short paragraph for each price change explaining

  (a) the date of the price change

  (b) what caused the change

  (c) whether this was a change in demand or supply

4. Find another price series over time. That is, find data that report the price over time on a product or commodity of your choosing that is not oil or gasoline. Any frequency – daily, weekly, annual – is fine. There are many great places to find price data online: the Bureau of Labor Statistics, the Bureau of Economic Analysis, and many zillions of other private sources.
Identify two changes to the prices you found and explain whether they are supply or demand driven. You should be able to answer this in under one page. Your answer should include the following

  (a) What the price series is

  (b) Where you got it from

  (c) A graph of the price over time

  (d) A description (as in 3) of when the change occurred and whether it was supply or demand driven

## 2   How to turn it in

Turn this assignment in to the google folder: for_students → use_numbers → assignment_1
Name the assignment "lastname_use_numbers_1". So mine would be "brooks_use_numbers_1."

## 3   Data

The dataset for the assignment has the following variables (columns in excel-speak).

| Variable | Definition and Source |
|---|---|
| wti_real | Real (inflation-adjusted) price of one barrel of West Texas Intermediate crude oil |
| year | Year of this price |
| month | Month of this price |
| month_year | Month and year of this price; sometimes it is helpful to have both in one variable |

## 4 R Commands

If you're interested, the R file that creates the data for this assignment is available here.

For this assignment, here are some R commands that may be helpful.

| R commands | Description |
| --- | --- |
| **Set up packages and load data** | |
| ```# install libraries if you don't have them # do this only once, ever install.packages('`tidyverse'`) # load packages library(tidverse) # read file dats <- readRDS('`H:/pppa6085/2020/use_numbers_assignment/assgnmt_1of3/data/use_nums_1of3_wti_20200824.rds'`)``` | The first command installs the set of packages called "tidyverse." Do this only once, ever. The next command loads the "tidyverse" packages. This command should go in your program. The final command loads the oil price data you downloaded. |
| **Find average price by decade** | |
| ```# make a decade variable dats$decade <- floor(as.numeric(dats$year)/10)*10 table(dats$decade) # find average by decade decader <- group_by(.data = dats, decade) decader <- summarize(.data = decader, mean(wti_real)) decader``` | Here we find average prices by decade. We begin by making a variable to denote decades. We divide each year by 10 and take the lowest integer in that number. For example, 1951 / 10 is 195.1, of which the lowest integer is 195. Multiply by 10 to get 1950. Therefore, all years with 195* have the variable `decade` equal to 1950. Once we know the decade, we tell R that we would like to do calculations by decade with the `group_by` command. We them `summarize` the data by decade, finding the average (mean) of `wti_real`. Finally, we print the output. |

| R commands | Description |
| --- | --- |
| Make a graph of price over time | |

| R commands | Description |
| --- | --- |
| ```
e1 <- ggplot() + geom_line(data =
dats, mapping = aes(x = month_year, y
= wti_real)) + labs(x = ''', y =
''west texas intermediate, dollars
per barrel'') +
scale_x_continuous(breaks =
seq(1940,2020,20), limits =
c(1940,2021)) + theme_minimal()
fn <-
paste0(''H:/pppa6085/2020/use_numbers_assignment/assgnmt_1of3/plots/wti_1940_to_2020_'',
dateo, ''.jpg'') ggsave(filename =
fn, plot = e1, device = ''jpg'', dpi
= 300, width = 6, height = 3, units =
c(''in''))
``` | The ggplot command makes a graph of price over time. The ggsave command saves the graph to my drive. |