ARE 106 Homework 3

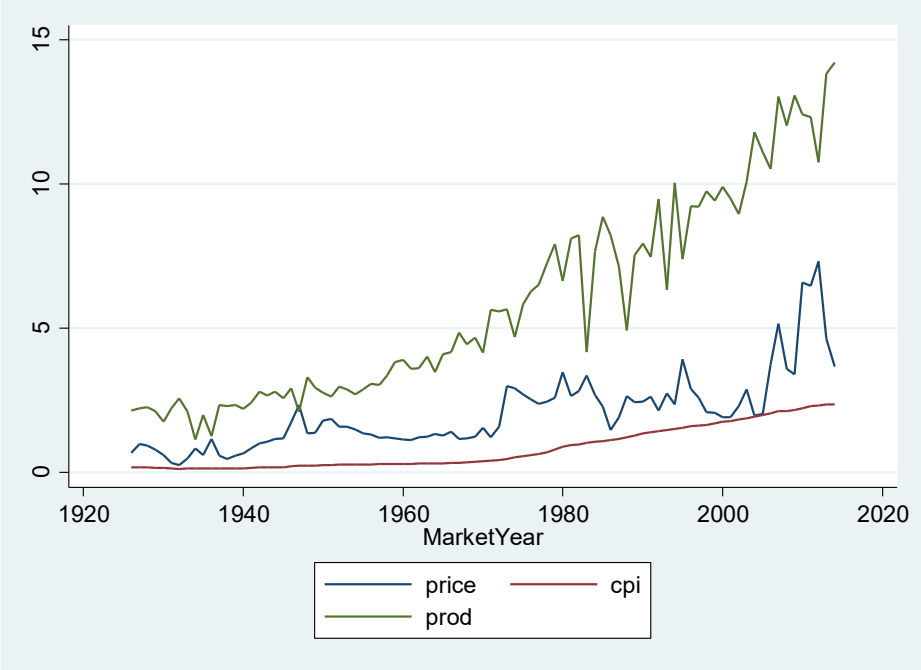
Spring 2020

DUE: 11:59pm Friday, May 29

Important:
- **Please turn your homework in on Canvas.**
- You must write or type your answers on the sheet on pages 3 and 4 of this assignment (there is an MS word version of the answer sheet on canvas)
- You must **include Stata output** (or R or Excel output if you use those programs). Either attach it to the file you upload or paste it into the Word document. Screenshots are fine.
- **Late homeworks** will automatically be given a score of **zero**.

Estimating a Demand Function

The data set "corndemand2020.dta" contains 89 observations on production (Q, in billions of bushels), price (P, in dollars per bushel), and the consumer price index (CPI) for the United State from 1926 through 2014. We will use this dataset to estimate a demand curve for corn. Here's a plot of the data.



An important detail. In US agriculture, the year begins in August. Production occurs in September and October, and the price is measured in March of the following calendar year. For example, the first row in the data is the 1926 crop year. In that year, production was 2.04 billion bushels and the price in March 1927 was $0.685. Put another way, the row corresponding to 1926 really means "1926/27".

You can read the dataset into Stata with the following command

use https://files.asmith.ucdavis.edu/corndemand2020

You can also download the data from Canvas. You may use other software such as *R* or Excel to do the assignment if you prefer.

1. Estimate the following equation by OLS using ordinary least squares:
   $$p_t = \beta_0 + \beta_1 q_t + \varepsilon_t$$
   where $p_t = \ln(P_t)$ and $q_t = \ln(Q_t)$.

2. What is your estimate of the elasticity of demand? Your estimate is positive, so it looks like something is wrong. In the following questions, we will try to figure out what is wrong.

3. First, the value of a dollar changed a lot from 1926 to 2014. We should really use real prices rather than nominal prices. Run the regression:
   $$r_t = \beta_0 + \beta_1 q_t + \varepsilon_t ,$$
   where $r_t = \ln(P_t) - \ln(CPI_t)$ is the real price.

4. Compute a 95% confidence interval for β_1.

5. Test for autocorrelation in the errors of your regression in (3). What are the implications of your test result for interpreting your results in (3) and (4)?

6. Use the Newey-West correction to fix the regression in (3). Try using up to 12 lags in the correction.

7. Plot the log real price (r_t) over time. What is the long run trend in prices?

8. It is possible that prices are being driven by some trends unrelated to quantity. Re-estimate your regression model in (3) with the year as an additional right-hand-side variable.

9. Now, let's consider changing the model by adding the lags of price and quantity.
   $$r_t = \beta_0 + \beta_1 q_t + \beta_2 r_{t-1} + \beta_3 q_{t-1} + \varepsilon_t$$
   Test for autocorrelation.

10. Using the discussion on slides 21 and 23 from Ch 9, interpret the results from your regression in (9). What is the long-run elasticity of demand? Interpret the error correction model.

11. We are interpreting our regression parameters as inverse elasticities of demand. What precisely are we assuming about how corn production is determined?

Name: _____

ARE 106 Answer Sheet for Homework 3

Spring 2020

Please write or type your answers to each question on the appropriate line. Each of the **11** parts of questions is worth **two** points. You will get a zero if you do not attach your computer output to this sheet.

Question 1

1) b_0: _____ $est.se(b_0)$: _____

b_1: _____ $est.se(b_1)$: _____

2) Elasticity: _____

3) b_0: _____ $est.se(b_0)$: _____

b_1: _____ $est.se(b_1)$: _____

4) Confidence Interval: _____

5) Null Hypothesis: _____ Alt. Hypothesis: _____

Statistic: _____ Critical Value: _____ Result: _____

6) b_0: _____ $est.se(b_0)$: _____

b_1: _____ $est.se(b_1)$: _____

7) Attach printout of plot. Describe trend: _____

_____

8) b_0: _____ $est.se(b_0)$: _____

b_1: _____ $est.se(b_1)$: _____

b_2: _____ $est.se(b_2)$: _____

9) b_0: _____ $est.se(b_0)$: _____

b_1: _____ $est.se(b_1)$: _____

b_2: _____ $est.se(b_2)$: _____

Autocorrelation test: Null Hypothesis: _____ Alt. Hypothesis: _____

Statistic: _____ Critical Value: _____ Result: _____

10) Elasticity: _____

Interpret: _____

_____

_____

_____

11) Assumption: _____

_____

_____

_____

	TA use only	
	Available Points	Score
Score	22	
Free points	8	_____
Total	30	_____

Free points are given to anyone who completes the homework including attaching computer output.