Homework 6 (56 Points)

Part I: Multiple Choices (2 Points Each)

Part I

Multiple Choices (2 Points Each)

1. Which of the following statements is correct?

   (a) The demand for natural gas is more elastic over a short period of time than over a long period of time.

   (b) The demand for smoke alarms is more elastic than the demand for Persian rugs.

   (c) **The demand for bourbon whiskey is more elastic than the demand for alcoholic beverages in general.**

   (d) All of the above are correct.

2. When the price of a bracelet was $25 each, the jewelry shop sold 20 per month. When it raised the price to $35 each, it sold 14 per month. Assuming the demand curve didn't change during this time, the arc price elasticity of demand for bracelets is

   (a) 1.66.

   (b) **1.06.**

   (c) 0.94.

   (d) 0.60.

3. Pierre says that he will spend exactly 10 dollars a day on coffee, regardless of the price of coffee. Pierre's demand for coffee is

   (a) perfectly elastic.

   (b) **unit elastic.**

   (c) perfectly inelastic.

   (d) None of the above answers is correct.

4. Last month, sellers of good Y took in $100 in total revenue on sales of 50 units of good Y. This month sellers of good Y raised their price and took in $120 in total revenue on sales of 40 units of good Y. At the same time, the price of good X stayed the same, but sales of good X increased from 20 units to 40 units. Suppose changes in the sales of X are driven by demand shifts as a result of changes in the price of Y, we can conclude that goods X and Y are

   (a) substitutes, and have a cross-price elasticity of 0.60.

   (b) complements, and have a cross-price elasticity of 0.60.

   (c) **substitutes, and have a cross-price elasticity of 1.67.**

   (d) complements, and have a cross-price elasticity of 1.67.

Part II: Problems

Problem 1 (4 Points)

Suppose the market for a good can be represented by the following equations of supply and demand:

$$\begin{aligned} \text{Supply:} \quad & P = 0.05Q_S \\ \text{Demand} \quad & P = 20 - 0.15Q_D \end{aligned}$$

, where Q_S and Q_D denote respectively quantity supplied and quantity demanded.

1. What are the equilibrium price quantity in this market? (2 Points)
   $(W^*, Q^*) = (5, 100)$

2. What are the price elasticity of demand and the price elasticity of supply at this equilibrium? (2 Points)

$$\epsilon_{d,p} = \frac{dQ_D}{dW}\frac{W^*}{Q^*} = \frac{1}{.15}\frac{5}{100} = .33$$

$$\epsilon_{s,p} = \frac{dQ_S}{dW}\frac{W^*}{Q^*} = \frac{1}{.05}\frac{5}{100} = 1$$

Note: the result that $\epsilon_{s,p} = 1$ should also be readily apparent from the fact that the supply curve is linear and has zero intercept.

Problem 2 (10 Points)

Fred spends his monthly paycheck going out to dinners and going to concerts. His income varies from month to month as does the price of dinners out and the price of concerts. The table below shows the data on number of times he has eaten out each month as well as his income in the month as well as the prices he faced during each month.

Month	Income	Dinner Price	Concert Price	Quantity of Dinners out
Apr	200	10	20	10
May	400	10	20	20
Jun	200	20	20	5
Jul	150	15	30	5

1. To calculate Fred's price elasticity of demand for dinners out, we should use the data for the months of April and June because the (income/**dinner price**/concert price) differs between these months but everything else is the same. Fred's arc price elasticity of demand for dinners out is 1. (2 Points)

2. To calculate Fred's income elasticity of demand for dinners out, we should use the data for the months of April and May because the (**income**/dinner price/concert price) differs between these months but everything else is the same. Fred's arc income elasticity of demand for dinners out is 1. (2 Points)

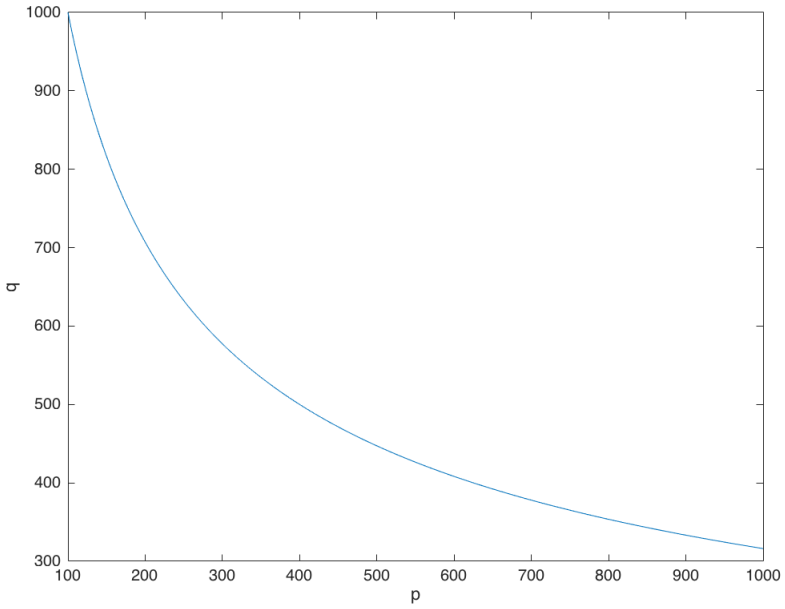
3. Dinners out are a (**normal**/inferior) good. (2 Points)

Problem 3 (12 Points)

Suppose the demand for a good is

$$q = \frac{10000}{\sqrt{p}} \tag{1}$$

1. Plot this demand curve[1]. (2 Points)



2. What is the price elasticity of demand for this good? (2 Points)

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0.5
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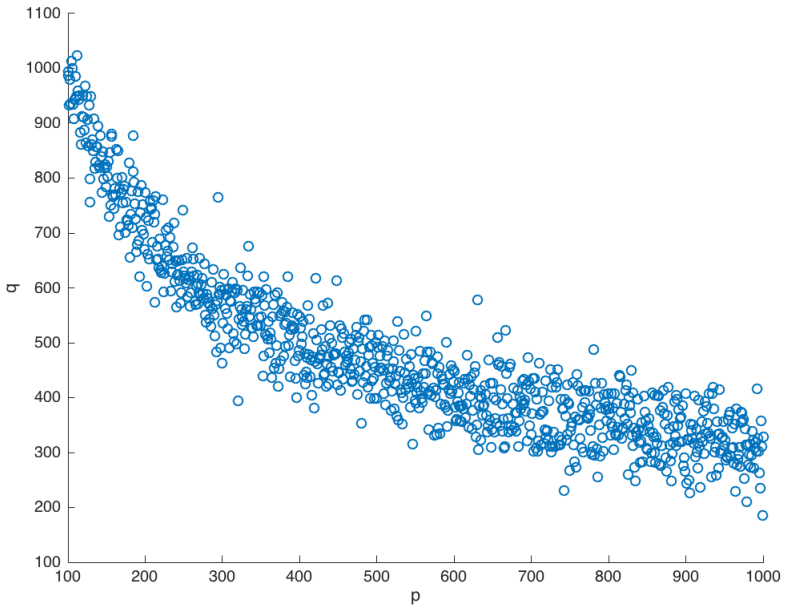
[1]For this question, draw p on the $x-$axis, q on the $y-$axis, and let p range from 100 to 1000.

In reality, the data we observe are often noisy. They may contain measurement error and unobserved variables. In the presence of measurement error, the relationship between observed prices and quantities can be represented by

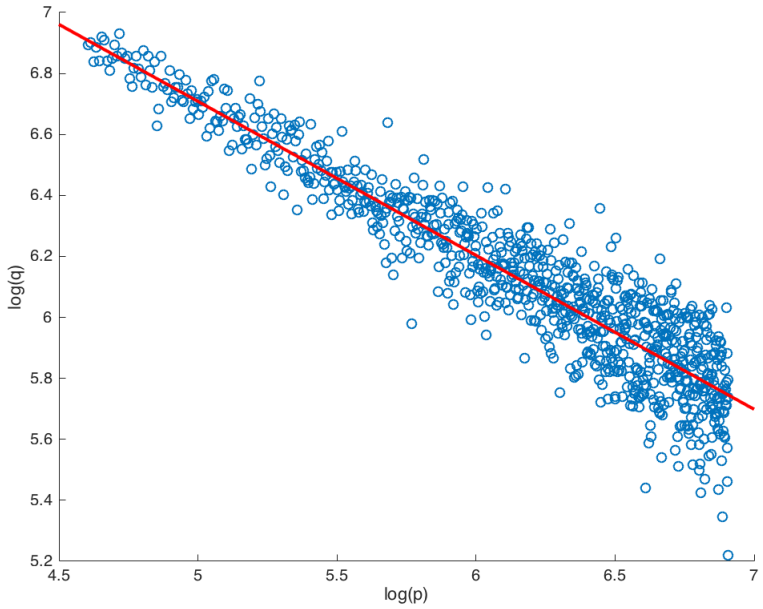
$$q = \frac{10000}{\sqrt{p}} + \epsilon \tag{2}$$

, where ϵ is random noise. "`Demand_data.csv`" contains data generated from (2). Use the data to answer the following questions:

3. Draw a scatter plot of p and q. (2 Points)



4. Draw a scatter plot of $\log(p)$ vs. $\log(q)$ and add a linear best-fit line. (2 Points)



5. Find out the slope of the linear best-fit line by regressing $\log(q)$ on $\log(p)$. (2 Points)

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-0.5
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6. How does your answer to question 5 compare with your answer to question 2? Why? (2 Points)
   They are equal (in absolute value). This is because $\epsilon_{d,p} = \left|\frac{dq/q}{dp/p}\right| = \left|\frac{d(\ln q)}{d(\ln p)}\right|$.

   Remark. Remember the price elasticity of demand, by definition, measures the relationship between percentage change in p and percentage change in q[2]. This is exactly what a scatter plot of $\log(p)$ and $\log(q)$ shows us. This is because for small r ($|r| \ll 1$), $\log(1+r) \approx r$[3]. Therefore, given a small percentage change in p, say p changes from p to $p(1+r)$[4], $\frac{p(1+r)-p}{p} = r \approx \log(1+r) = \log(p(1+r)) - \log(p)$. Therefore, the scatter plot of $\log(p)$ and $\log(q)$ shows us the relationship between percentage change in p and percentage change in q. Assuming that all data lie on the same demand curve, then (the absolute value of) the slope in the plot of $\log(p)$ vs. $\log(q)$ is by definition the price elasticity of demand.

[2] i.e., given, say, a 1% increase in p, how much will q change in percentage terms?
[3] By Taylor expansion, $\log(1+x) = x - \frac{1}{2}x^2 + \frac{1}{3}x^3 \ldots \approx x$ for small x.
[4] say, $r = 0.01$: a 1% increase.

Problem 4 (6 Points)

Read the article "How computer automation affects occupations: Technology, jobs, and skills"[5].

1. Briefly summarize the article. (2 Points)

2. Why does the author claim that "if a job is only partially automated, employment might actually increase"? According to the author, what determines whether automation will on net increase or decrease available jobs? If you can, use demand and supply diagrams to illustrate your point. (4 Points)

   `Demand elasticity. If demand is highly elastic, automation decreases cost and thereby significantly increasing demand, leading to an increase in total labor jobs, even if the labor share decreases in production due to automation (Of course, if automation drives labor share to 0 -- meaning labor is no longer needed in production, then this effect will not exist -- hence it is important for automation to be only ‘‘partial’’)`

[5] You can read the research paper behind this article here.

Problem 5 (4 Points)

Read the article "Taxi v Uber: A Tale of Two Cities".

1. In what sense can Taxi and Uber be complements and in what sense can they be substitutes? (2 Points)

   The reason that Uber can be a substitute for Taxi is straight-forward. But how can it be a complement? Uber could be a complement if it introduces *new* customers to the market of driver services (including both Taxi and Uber). For example, some people always used public transportation before the introduction of Uber. After the introduction of Uber, these people started taking Uber *as well as* Taxi as they became accustomed to driver serices.

2. According to the evidences presented in this article, has Uber been a complement or substitute to Taxi service in New York city? Why? (2 Points)

   Substitute in CBD. In rest of NYC, Uber mainly attracted new riders.

Problem 6 (12 Points)

1. Read the article "The Effects of Uber's Surge Pricing: A Case Study".
2. Listen to the podcast: Why Uber is an Economists Dream[6].

Answer the following questions:

1. What is dynamic pricing? How does Uber use dynamic pricing ("surge prices") to match supply and demand? (2 Points)

   `Dynamic pricing refers to price adjustment in real time. Uber adjusts surge pricing in real time to match supply with demand. When demand is high and there is a shortage, surge price increases, attracting more drivers. When demand is low and there is a surplus of drivers, suge price deceases, attracting riders.`

2. According to the estimated demand elasticities, do Uber consumers have elastic or inelastic demand? (2 Points)

   `Inelastic (around 0.55 for the whole sample)`

3. Are the estimated demand elasticities short-run or long-run elasticities? Why? (2 Points)

   `Short-run`

4. What is the total estimated consumer surplus created by Uber in the U.S.? (2 Points)

   `$2.9 billion in four U.S. cities, $6.8 billion for the entire U.S. in 2015`

5. According to Levitt (host of the podcast), dynamic pricing increases welfare because it allows consumers who have the highest values for Uber service to get a ride when demand is high (i.e. the service is obtained by those who value it the most). Do you agree or disagree? (2 Points)

   `''Value'' here means willingness to pay (WTP) and is the result of both preference and budget constraint.`

[6] You can read the research paper behind this article here.

6. What are some of the limitations of dynamic pricing? Explain why consumers can be unhappy with some of its applications. (2 Points)

   Maybe perceived as taking advantage of bad situations (such as when natural disaster strikes, leading to high demand and low supply) and not promoting equity -- effectively allocating the good/service to higher income individuals when demand is high relative to supply.