Discussion 4

ELASTICITY:

The responsiveness in one variable when another variable changes.

1 Elasticity of Demand:

- Price Elasticity Of Demand:

- The ratio of the percentage change in Quantity Demanded to the percentage change in Price (the responsiveness of Quantity to a change in Price).

- Inelastic Demand:

- When the Quantity Demanded is not significantly affected by a change in Price. The coefficient (of elasticity) is between 0 and 1.
    * Characteristics: few substitutes, goods that customer's barely notice the price change (small budget goods), necessities (ie. food, life-saving medicine, etc.), and short time horizon.
    * Perfectly Inelastic Demand: When Quantity Demand does not respond at all to a change in Price (vertical line). The coefficient is 0.

- Elastic Demand:

- When the Quantity Demanded is significantly affected by a change in Price. The coefficient is between 1 and infinity.
    * Characteristics: many substitutes, big-budget/noticeable goods, luxury goods (non-necessities), long time horizon (example to contrast time horizon's: oil crisis).
    * Perfectly Elastic Demand: When the Quantity Demanded drops to zero with the slightest change in Price (horizontal line). The coefficient is infinity.

- Unitary Elasticity (Unit Elastic):

- When the percentage change in Quantity Demanded is the same as the percentage change in Price. (the coefficient is 1)
    * For a linear demand line, the Unit Elastic point is also the Revenue Maximization point (max: P x Q).

- Notable Features About Price Elasticity Of Demand:

- For any linear demand line (that is not strictly vertical or horizontal) there is an elastic region, which is found in the higher price region, and an inelastic region, which is found in the lower price region.

- If there is an increase in price in the inelastic range of the demand, then there is an increase in total revenue. If there is an increase in price in the elastic range of the demand, then there is a decrease in total revenue. (Vice versa).

- Multiple formulas for finding Elasticity:

  Elasticity of Demand = (Percent Change in Quantity Demanded) / (Percent Change in Price)

  (The Midpoint Formula) Elasticity of Demand = [(Change in Quantity Demanded/Quantity Demanded @midpoint)/(Change in Price/Price @midpoint)]

  (Point) Elasticity of Demand = (1 / Slope) x (P / Q)

2 Other Applications of Elasticity:

- Income Elasticity of Demand

- Formula: (Percent Change in Quantity Demanded) / (Percent Change in Income)
  * If the elasticity is POSITIVE, the good is a NORMAL GOOD (if it is greater than 1 the good is a luxury good).
  * If the elasticity is NEGATIVE, the good is an INFERIOR GOOD.

- Cross-Price Elasticity of Demand

- Formula: (Percent Change in the Quantity of Good A)/(Percent Change in the Price of Good B)
  * If the Elasticity is POSITIVE, the two goods are SUBSTITUTES
  * If the Elasticity is NEGATIVE, the two goods are COMPLEMENTS

- Elasticity of Supply

- Formula: (Percent Change in Quantity Supplied)/(Percent Change in Price)

    * If the Elasticity is greater than 1, than Supply is relatively ELASTIC. If the Elasticity is less than 1, then the Supply is relatively INELASTIC.

    * In terms of Supply, Elastic goods are goods that firms can easily increase output of a good when there is the slightest increase in price (ie. pens). Inelastic goods are goods that firms have a harder time increasing the output of a good when there is a change in price (ie. Mining).

- Elasticity of Labor Supply

- Formula: (Percent Change in Quantity of Labor Supplied)/(Percent Change in Wages)

    * Almost Always Positive: exceptions include very high wage jobs, where a laborer decides to "buy" leisure time and supply less labor.

Final thoughts/Looking ahead: Elasticises can determine determine who (consumer or producer) bears the burdens of price changes for goods (ie. taxes on insulin vs. tax on sour-cream onion chips). This is important when policymakers are trying to analyze the consequences of their initiatives and agendas.

3 Elasticity Problems

Exercise 1

Suppose demand is given by $Q = 10 - P$.

1. Suppose the price is originally at \$4 and increases to \$5. Using these two points, and the regular percentage change formula, calculate price elasticity of demand.
2. Now suppose the price falls from \$5 to \$4. Again using the regular percentage formula, calculate price elasticity of demand. What problem is apparent given your answers to this and the previous part?
3. Using the mid-point formula, calculate the price elasticity of demand between \$4 and \$5. What is the advantage of this formula? Is demand elastic or inelastic?
4. Calculate the revenue to a firm in this market if the price is set at \$4 and \$5.
5. Repeat parts (3) and (4) using the prices \$8 and \$9. Make a conjecture about the relationship between price elasticity and the effect of increasing price on revenue. What will be the elasticity at the revenue maximizing price?

Exercise 2

The following table gives part of the demand schedule for widgets in the USA:

Price	1	3	5
Quantity Demanded	18	10	4

1. Calculate the price elasticity of demand as the price increases from \$1 to \$3 using the mid-point formula. What happens to the total revenue as a result of the price increase?
2. Calculate the price elasticity of demand as the price increases from \$3 to \$5 using the mid-point formula. What happens to the total revenue as a result of the price increase?

Exercise 3

Suppose demand for Donuts in Madison is given by $P = 120 - 3Q$

1. Calculate the price elasticity of demand at $P = 30$. What adjustment should be made to the price to increase total revenue?
2. Calculate the price elasticity of demand at $P = 90$. What adjustment should be made to the price to increase total revenue?
3. Calculate the price and quantity at which the total revenue is maximized. What is the maximum revenue that can be obtained?

4 Multiple Choice Questions

Exercise 4 Which of the following statements is true?

(a) The price elasticity of demand for downward-sloping linear demand is constant across all points on the demand curve.

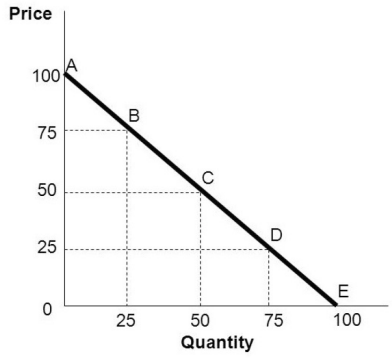
(b) With a perfectly elastic demand curve, increasing price increases total revenue.

(c) With a unitary elastic demand curve, increasing price increases total revenue.

(d) On the inelastic part of a demand curve, increasing price increases total revenue.

Exercise 5 Which of the following statements is true?

Table 1: Multiple Choice Question 2



(a) Point B is more elastic than point D.

(b) At point C, elasticity is 0.

(c) All points are elastic.

(d) None of the above.

Exercise 6 Consider the market for peanut butter and jars of jelly. Suppose that the price elasticity of demand for peanut butter is -2, and that there is a 10% drop in the quantity demanded for peanut butter following a change in price. What is the price change?

(a) A 10% decrease in price

(b) A 5% decrease in price

(c) A 10% increase in price

(d) A 5% increase in price

Exercise 7 Following from the previous exercise, now suppose that the cross-price elasticity of demand for jelly in response to a change in price for peanut butter is -3. What is the change in demand for jelly?

(a) A 15% decrease in the demand for jelly

(b) A 5% decrease in the demand for jelly

(c) A 15% increase in the demand for jelly

(d) A 5% increase in the demand for jelly

Exercise 8 Alice is a book lover and she says, "I always spend half of my monthly salary on books regardless of the price." We can conclude that her demand for books is

(a) elastic

(b) inelastic

(c) unitary elastic

(d) perfectly inelastic

Exercise 9 Suppose the government imposed an effective price floor on a good. If the government raises the effective price floor, the total revenue

(a) would increase

(b) would decrease

(c) would remain unchanged

(d) may increase, decrease, or remain unchanged

Exercise 10 Suppose the government imposed an effective price ceiling on a good. If the government raises the effective price ceiling, the total revenue

(a) would increase

(b) would decrease

(c) would remain unchanged

(d) may increase, decrease, or remain unchanged

4.1 Extra Tariff Practice!

Consider the pumpkin market in USA. Suppose the domestic demand for pumpkins is given by $Q = 100 - 2P$, and the domestic supply is given by $Q = 2P - 20$. Consider this market opening up to trade. For simplicity assume the USA's pumpkin output is negligible in the world pumpkin market, so its presence does not affect the world price.

1. If the world price for pumpkins is \$40, what will be the quantity demanded and supplied in the domestic market? Will the US have excess demand or supply? How large is it? Find consumer and producer surplus. How do they change (qualitatively) compared to the closed market case?

2. If the world price for pumpkins is \$10, what will be the quantity demanded and supplied in the domestic market? Will the US have excess demand or supply? How large is it? How much will consumer and producer surplus change compared to the closed market case?

3. Suppose that the world price for pumpkins is \$10, and now the US government implements a tariff of \$10, then how many pumpkins will be imported? How much revenue is raised for the government? What is the deadweight loss caused by the tariff? Illustrate on a diagram.