

ECN 453: Useful Basic Micro

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Plan

1. Review of demand elasticity
2. Review of useful terms for this class

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Review of demand elasticity

- **Price elasticity of demand:** Percentage change in quantity demanded for a 1 percent change in price.
- In math:

$$\epsilon = \frac{dq/q}{dp/p} = \frac{dq}{dp} \frac{p}{q}$$

- Where:
 - $\frac{dq}{dp}$: slope of the demand curve
 - q: quantity demanded
 - p: price
- **Notation:** The book sometimes writes demand as e.g. $D(p) = 10 - 2p$ or as e.g. $q = 10 - 2p$. These are equivalent.

Demand elasticity: sign; $\epsilon = \frac{dq}{dp} \frac{p}{q}$

- Since demand slopes downwards ($\frac{dq}{dp} \leq 0$) demand elasticity will **always be (weakly negative)**.
- Economists - confusingly - often just state the magnitude not the sign.
- So, if an economist says 'the demand elasticity is 1.2', this does **not** mean that quantity demanded increases as you increase the price!
- Instead, they will be referring to the absolute value (i.e. the true elasticity is -1.2 but the sign is implicit).

Demand elasticity: example; $\epsilon = \frac{dq}{dp} \frac{p}{q}$

- **Question:**
- Demand is given by $q = 10 - 3p$. Compute the price elasticity of demand at $p = 1, q = 7$.

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- Demand is given by $q = 10 - 3p$. Compute the price elasticity of demand at $p = 1$, $q = 7$.

- **Solution:**

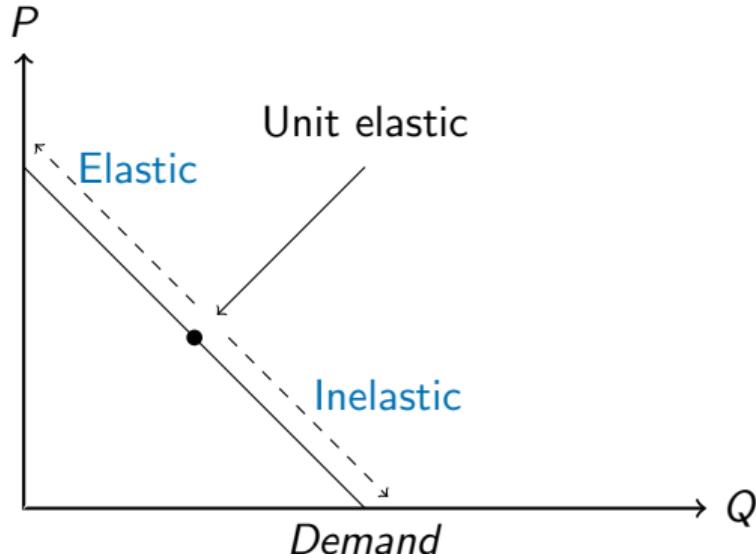
- Compute the slope of the demand curve: $\frac{dq}{dp} = -3$
- Plug the slope into the price elasticity of demand formula:

$$\epsilon = \frac{dq}{dp} \frac{p}{q} = -3 \times \frac{1}{7} = -3/7$$

Demand elasticity: classifications $\epsilon = \frac{dq}{dp} \frac{p}{q}$

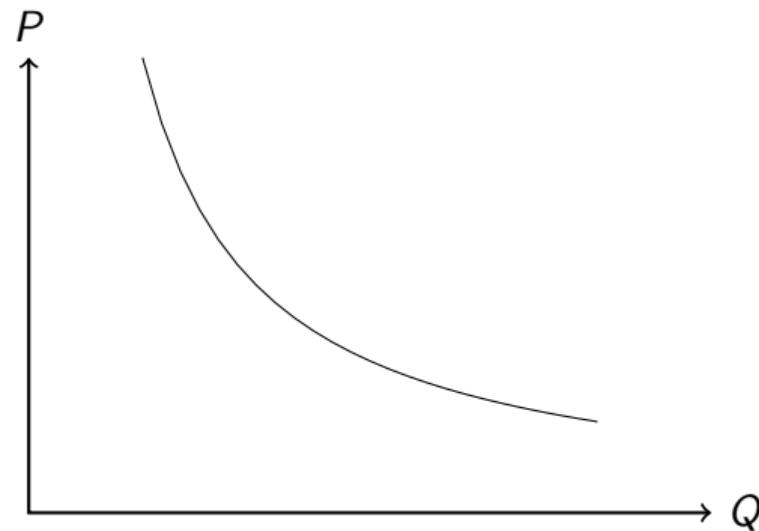
- $\epsilon < -1$ (e.g. -1.2): elastic
- $\epsilon = -1$
- $\epsilon > -1$ (e.g. -0.8): inelastic

Demand elasticity: linear demand; $\epsilon = \frac{dq}{dp} \frac{p}{q}$



- **Note:** Elasticity changes as we move along the demand curve.
- Why? Even though the slope $\frac{dq}{dp}$ is constant, the base price and quantity change as we move along the demand curve.

Demand elasticity: constant elasticity demand curve



- Constant elasticity demand curves: $p = aq^{1/\epsilon}$ where a is a number and ϵ is the elasticity.
- E.g. demand given by $p = 2q^{1/(-3)}$ has an elasticity of -3 .
 - (You don't need to know how to prove this, just recognize a constant elasticity demand curve and know how to read off the elasticity.)

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Useful terms: revenue

- Total revenue (TR): $TR = p \times q$
- Marginal revenue (MR):
 - Change in total revenue for a 1 unit change in quantity

$$MR = \frac{dTR}{dq}$$

Useful terms: revenue - example

- **Example:** Suppose that demand is given by: $p = 4 - 2q$. What is the marginal revenue?

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- **Example:** Suppose that demand is given by: $p = 4 - 2q$. What is the marginal revenue?
- **Solution:**
 - First compute the total revenue:
 - $TR = p \times q = (4 - 2q) \times q = 4q - 2q^2$
 - Next, compute the marginal revenue:
 - $MR = \frac{dTR}{dq} = 4 - 4q$
- **Note:** An important trick is that if demand is **linear** then marginal revenue has the same intercept as demand but twice the slope.
 - In the above example, demand has a slope of -2 and an intercept of 4 . Marginal revenue has the same intercept (4) but twice the slope ($-4 = 2 \times -2$).

Useful terms: cost

- Cost function $C(q)$: total cost (TC) of producing q units of output.
- Marginal cost (MC): change in TC for a 1 unit change in quantity q .

$$MC = \frac{dC(q)}{dq}$$

- Average cost (AC): the average total cost

$$AC = \frac{C(q)}{q}$$

- Fixed cost (FC): the total cost at $q = 0$ units of output

$$FC = C(0)$$

- Variable cost (VC): the total cost minus the fixed cost

$$VC = TC - FC$$

Useful terms: cost - example

- **Example:**

- Suppose that total cost is given by $C(q) = 5 + 10q$.
- What is marginal cost (MC)? What is average cost (AC)? What is fixed cost (FC)? What is variable cost (VC)?

Useful terms: cost - example

- **Example:**

- Suppose that total cost is given by $C(q) = 5 + 10q$.
- What is marginal cost (MC)? What is average cost (AC)? What is fixed cost (FC)? What is variable cost (VC)?

- **Solution:**

- $MC = \frac{dC(q)}{dq} = 10$
- $AC = \frac{C(q)}{q} = \frac{5+10q}{q} = 5/q + 10$
- $FC = C(0) = 5$
- $VC = TC - FC = 5 + 10q - 5 = 10q$

Useful terms: profits vs producer surplus vs consumer surplus vs total surplus

- Producer surplus (PS) (or 'variable profit'): area below the price and above supply curve.
- Important:

$$\text{total profit} = \text{producer surplus} - FC$$

- The distinction between profit and producer surplus can often be a little confusing.
 - Typically, if fixed costs are not mentioned in a problem then implicitly $FC = 0$ and total profit = producer surplus.
- Consumer surplus (CS): the area above price and below the demand curve.
- Total surplus (TS): $TS=PS+CS$
 - Note: we use total surplus as a measure of how 'efficient' the market is.

Summary of key points*

- Know how to compute the price elasticity of demand from a demand curve and know what is 'inelastic' vs 'elastic' demand
- Know that elasticity changes along a linear demand curve but not along a constant elasticity demand curve
- Know what TR and MR mean and how to compute them from a demand curve.
- Know the 'twice the slope' trick to compute MR from a linear demand curve.
- Know what TC , MC , AC , FC , VC mean and how to compute them from a cost function $C(q)$
- Know what PS , CS , TS mean and how to compute them.

*To clarify, all the material in the slides, problem sets, etc is assessable unless stated otherwise, but I hope this summary might be a useful place to start when studying the material.

References

- Elasticity graph from:
- <http://static.latexstudio.net/wp-content/uploads/2016/06/tikzforeconomists-110619150244-phpapp01.pdf>