2 Demand

2.1 Lecture 4: Demand Curves

2.1.1 Deriving demand curve

- **Demand curve** shows the relationship between price and quantity demanded. Often we connect consumer choice theory to demand curves by varying prices while holding income constant.

2.1.2 Elasticity

- **Price elasticity** of demand is defined to be

$$\epsilon = \frac{\delta Q/Q}{\delta P/P}$$

  For example, if quantity demanded falls by 2% for each 1% increase in price, $\epsilon = -2$.

- **Perfectly inelastic demand**: demand does not change regardless of what happens to price, $\epsilon = 0$. When there is no plausible substitute, demand is likely to be perfectly inelastic.

- **Perfectly elastic demand**: demand will drop to zero if price moves at all, $\epsilon = -\infty$. When there are perfect substitutes, demand is likely to be perfectly elastic.

- The elasticity affects consumers' response to a shift in price: if the elasticity is between 0 and -1, then firms can raise revenues by raising the price (since consumers will still buy the good in significant quantities); if $\epsilon < -1$, then raising the price results in a decline in firm revenue.

- Accurately estimating an elasticity requires a shift along the supply curve (e.g., a tax on suppliers would shift the supply curve up, causing the equilibrium price to rise and quantity to fall, from where we can calculate the price elasticity of demand).

2.1.3 Shifts in demand curve

- To **trace out** a demand curve, we change prices holding income constant. To **shift** a demand curve, we change income holding prices constant.

- The **"Engel Curve"** shows the direct relationship between income and consumption.

- The **income elasticity of demand** shows what happens to consumption as income changes.

$$\gamma = \frac{\delta Q/Q}{\delta Y/Y}$$

- Most goods are **normal goods**: they have a positive income elasticity. Consumption of normal goods increases as income rises.
- **Inferior goods** have a negative income elasticity. Consumption of inferior goods falls as income rises.
- **Necessities** are goods with $\gamma < 1$. You spend a smaller share of your income on necessities as income rises.
- **Luxuries** are goods with $\gamma > 1$. You spend a larger share of your income on necessities as income rises.

2.1.4 Income and substitution effect

- An increase in price has two effects: **income effect** and **Substitution effect**.
- **substitution effect** is the change in quantity of good demanded when good's price changes, holding utility constant.
  - When one good gets relatively expensive, the substitution effect is the extent to which you shift away from that good.
- **Income effect** is the change in quantity of a good demanded because of a change in income, holding prices constant.
  - Rise in price effectively lowers the consumer's income, and this has a distinct effect on demand.
- Income effect reinforces substitution for normal goods, as both have a negative effect on the quantity demanded as income rises. But income effect works against it for inferior goods. Therefore, substitution effect is always negative, but income effect can be positive.
- Accordingly, the overall effect of a price increase on consumption of a good can be negative (for a normal good), or positive, it is an inferior good. And the income effect is larger than the substitution effect.

price change	substitution effect	income effect	total effect
normal good price rises	≤ 0	≤ 0	≤ 0
normal good price falls	≥ 0	≥ 0	≥ 0
inferior good price rises	≤ 0	≥ 0	uncertain
inferior good price falls	≥ 0	≤ 0	uncertain

- **Giffen good** is a good with a positive own-price elasticity.

2.1.5 TO KNOW – Conceptual Understanding

- Explain the difference between a movement along the demand curve and a shift of the demand curve
- Explain what the elasticity of demand/supply imply about changes in equilibrium
- Explain what quantities observed after price changes imply about the income and substitution effects

2.1.6 TO KNOW – Graphical and Math Understanding

- Given an algebraic expression for demand, calculate the price elasticity of demand at any point along the curve
- Graph budget constraint lines and show how the line shifts or rotates when a price of a good changes or the agent's income changes
- Derive a demand curve mathematically given a utility function, the price of one of the goods, and an income level
- Derive an Engel curve mathematically given a utility function and the price of both goods
- Show and calculate the effect of a price change in a graph showing a consumer's optimal bundle; decompose the effect graphically into the income and substitution effect

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