Deducing Preferences from Behavior

Fundamental strategy

1. Collect data on bundles purchased
2. Find demand equations that match

Result:

- Allows *predictions of response* to policies (ΔQ, etc)
- Allows *measurement of welfare* impacts (ΔSS, etc)

Example:

Observe a household during two periods, months 1 and 2:

Observation	M	P_x	P_y	Q_x	Q_y
1	100	1	2	20	40
2	120	2	2	12	48

Blue: Economic conditions

Yellow: Choice

Look for demand equations that are consistent with the data

Fundamental process:

1. *Guess* a general demand equation
2. Use first observation to *calculate unknown parameters*
3. *Test prediction* on second observation
4. Reject guess and try again if the prediction is wrong

Try PC

General demand for X:

$$Q_x = \frac{\beta M}{\beta P_x + P_y}$$

Inserting data for observation 1:

$$M = 100, P_x = 1, P_y = 2, Q_x = 20$$

$$20 = \frac{\beta * 100}{\beta * 1 + 2}$$

Solving for β:

$$20(\beta + 2) = 100\,\beta$$

$$20\,\beta + 40 = 100\,\beta$$

$$40 = 80\,\beta$$

$$\beta = 0.5$$

Conclusion: PC demand that fits observation 1

$$Q_x = \frac{0.5\,M}{0.5\,P_x + P_y}$$

Predicting Q_x for observation 2

$$M = 120, P_x = 2, P_y = 2$$

$$Q_x = \frac{0.5\ * 120}{0.5\ * 2 + 2} = \frac{60}{3} = 20$$

Compare with actual for observation 2:

Observed $Q_x = 12$

Conclusion: **reject** PC

Behavior is **not** consistent with PC preferences

Important note ⚠

Must compare **one demand** for **two observations**

- *First* observation to calculate the parameter
- *Second* observation to test the prediction

Not equivalent to use **two demands** and **one observation**

Try CD

General demand for X:

$$Q_x = \frac{aM}{P_x}$$

Inserting data for observation 1:

$$\mathrm{M} = 100, P_x = 1, P_y = 2, Q_x = 20$$

$$20 = \frac{a * 100}{1}$$

Solving for a

$$a = \frac{20}{100} = 0.2$$

Conclusion: CD demand that fits observation 1:

$$Q_x = \frac{0.2\ M}{P_x}$$

Predicting Q_x for observation 2

$$M = 120, P_x = 2, P_y = 2$$

$$Q_x = \frac{0.2\ * 120}{2} = \frac{24}{2} = 12$$

Compare with actual for observation 2:

Observed $Q_x = 12$

Conclusion: can't reject CD

Behavior is consistent with CD preferences

General approach

- Use econometrics to fit demand equations
- Conceptually, follows steps above

Quick tests for some preferences

PC

If preferences are PC:

$$\frac{Q_x}{Q_y} = \beta$$

Can test by checking ratio for two observations:

Observation	Q_x	Q_y	β
1	20	40	20/40 = 0.5
2	12	48	12/48 = 0.25

Differs: reject PC

CD

If preferences are CD:

$$\frac{P_x Q_x}{M} = a$$

Checking share for two observations:

Observation	M	P_x	Q_x	a
1	100	1	20	1*20/100 = 0.2
2	120	2	12	2*12/120 = 0.2

Same: CD is consistent; can't reject

Daily exercise