CH2 Economic Methods and Economic Question & CH3 Optimization: Doing the Best You Can

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July 12, 2022

Outline

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Economic Model

- A model is a simplified description, or representation, of the world.
- Economic method (scientific method):
  1. Develope models to explain some part of the world.
  2. Test the models with data to see how the model matches real world human behaviors.

Causation and Correlation

- Causation occurs when one thing directly affects another. Social science focuses on defining causation.
- Correlation is only a mutual relationship.
- **Correlation does not imply Causation!!!**

Why doesn't correlation imply causation?

- **Omitted variables:** A and B are both affected by C, so there's correlation between A&B.
  But the causation is between A&C and B&C. There's no causation between A&B.
- **Reverse causality(simultaneous causality):** A causes B or B causes A, or both?

Finding out the real causation: experimental economics

- Subjects are randomly assigned to treatment or control group. (difficult and expensive to do)
- **Natural experiment:** Subjects are assigned in a nearly random way to treament and control group not purposefully by the researcher. (多來自政策變化)

CH2 Exercise

Exercise1: Problem2-1

Some studies have found that people who owned guns were more likely to be killed with a gun. Do you think this study is strong evidence in favor of stricter gun control laws? Explain.

Answer:

- There might be some omitted variables.
- People who thought they were at risk (perhaps because they live in dangerous neighborhoods) were more likely to buy a gun for self-protection.
- There are more people killed with guns because they live in dangerous neughborhoods, not because they owned guns.
- Again, **correlation does not imply causation.**

Exercise2: Reverse Causality

Many studies have found that people who smoke tend to be more depressed. So, researchers may assume that smoking causes depression. Is this the correct direction of causality?

Answer:

- The opposite of this is also possible.
- It is the depression that forces people to smoke. Many people view smoking as a way to control their emotions.
- **Reverse causality** may occur in correlation.

CH3 Review

Optimization

- Optimizing is to select the best feasible option, given the availble information.
- Optimization is a good model (approximation) of human behaviors in most situations.

Optimization using total value

- Translate all costs and benefits into common units, like dollars per month, utility, etc.
- Calculate the total net benefit of each alternative.
- Pick the alternative with the highest net benefit.

Optimization using marginal analysis

- Translate all costs and benefits into common units, like dollars per month, utility, etc.
- Calculate the marginal consequences of moving between alternatives.
- **Principle of Optimization at the Margin:** choose the alternative that moving toward it makes you better off and moving away from it makes you worse off.

Two ways of optimization will lead to the same result.

CH3 Exercise

Exercise1: Problem3-7

Background: Scott is planning on buying a car. He can choose between six types of powering: petrol, diesel, gas, hybrid, electric, or hydrogen. Being environmentally conscious, his total benefit will reflect the amount of greenhouse gases a car releases. The total cost is the price and upkeep of the car. He has a seventh option, using public transport. Assume Scott has been using public transport and has received 0 total benefits and costs.

Exercise1: Problem3-7 (continued)

a. Find the total net benefit for each.

c. Find the marginal benefit and the marginal cost for each.

Type of Car	Total Benefit	Total Cost
Public Transport	0	0
Petrol	15	10
Diesel	16	12
Gas	18	12
Hybrid	30	25
Electric	40	36
Hydrogen	60	58

Answer:

Type of Car	Total Benefit	Total Cost	Total Net Benefit	Marginal Benefit	Marginal Cost	Marginal Benefit - Marginal Cost
Public Transport	0	0	0	-	-	-
Petrol	15	10	5	15	10	5
Diesel	16	12	4	1	2	-1
Gas	18	12	6	2	0	2
Hybrid	30	25	5	12	13	-1
Electric	40	36	4	10	11	-1
Hydrogen	60	58	2	20	22	-2

Exercise1: Problem3-7 (continued)

b. Use optimization in total value to determine the best option for Scott.

d. Show that marginal analysis would also make him buy a gas-powered car.

Answer:

b. Scott should buy a gas-powered car since it has the highest total net benefit.

d. Scott should seek improvement in marginal analysis that marginal benefit outweighs the marginal cost. In this case, the gas-powered car is such a choice.

We found that optimization using total value and optimization using marginal analysis gave the same result.

Exercise2: Problem3-8

It is possible to use equations to do marginal analysis.

Suppose your firm has a marginal revenue given by $MR = 21 - 2Q$. This means that the fifth unit of output brings in $21 - 2 \times 5 = 11$ of additional revenue.

And the marginal cost for your firm is $MC = 3 + Q$. This means that the fifth unit of output increases cost by $3 + 5 = 8$.

a. Is it a good idea to produce the fifth unit of output? Why or why not?

b. Find the Q that sets marginal cost equal to marginal revenue ($MC = MR$). As a preview of upcoming chapters, try to explain why this value maximizes profit.

Answer:

a. At Q $= 5$,

- *Marginal revenue* $= 21 - 2 \times 5 = 11$
- *Marginal cost* $= 3 + 5 = 8$
- Producing the fifth unit of output is a good idea as the additional revenue is greater than the additional cost.

b. To set marginal cost equal to marginal revenue, we have

- $21 - 2Q = 3 + Q$, which implies $Q^* = 6$
- At lower output levels, MR will exceed MC.
- At higher output levels, MR will be lower than MC.
- When the additional revenue equals to the additional cost, the firm maximize its profit.