

Chapter 1 of Nicholson and Snyder (pages 3-19)

1. Economic models are simplified abstractions of reality

1.1. What is a "good" model?

1.2. How are economic models verified?

1.2.1. Directly – by establishing validity of assumptions

1.2.2. Indirectly – by showing that the model correctly predicts real-world events

1.3. Verifying profit maximization model

1.3.1. Assumptions:

1.3.1.1. Profits are the only relevant goal for firms

1.3.1.2. Firm has complete and sufficient information

1.3.2. Direct verification – testing assumptions

1.3.2.1. In questionnaires, managers mention other goals and/or recognize limited information, while agreeing that profit is important

1.3.2.2. Generally inconclusive results for testing assumptions

1.3.2.3. Milton Friedman argues that models can't be directly verified

1.3.2.3.1. Assumptions are "unrealistic" by nature

1.3.2.3.2. Perfectly "realistic" assumptions make models no different, and no less complex, than the systems they're trying to simplify

1.3.3. Indirect verification – testing predictions

1.3.3.1. The model can be verified as "good" if economic agents behave as if they were profit maximizers

1.3.3.2. Profit maximization hypothesis generates empirically testable propositions about economic behavior

1.3.3.2.1. A firm is competitive, faces price p and cost C , function of quantity, q ; profit is

$$\text{profits} = \pi = pq - C(q)$$

1.3.3.2.2. Profit maximization requires finding q that maximizes the equation above

1.3.3.2.3. π is maximized when

$$\frac{d\pi}{dq} = p - C'(q) = 0$$

Or

$$p = C'(q)$$

1.3.3.2.3.1. In other words, when price equals marginal cost of production

1.3.3.2.4. The above is only a "first-order" condition for a maximum (meaning that it must hold for a value of q to maximize profits, but it doesn't guarantee that a given q actually does maximize profits)

1.3.3.2.5. The second-order condition for maximization is that at q^* it must be the case that

$$\frac{d^2\pi}{dq^2} = -C''(q) < 0$$

Or

$$C''(q^*) > 0$$

1.3.3.2.6. That is, marginal cost must be increasing at q^* if it is a true maximum

1.3.3.3. We can use the above to "predict" how a firm will react to a change in price

1.3.3.3.1. Differentiate the first-order condition with respect to p and get

$$\frac{dp}{dp} = \frac{dC'(q^*)}{dp} \Rightarrow 1 = C''(q^*) \cdot \frac{dq^*}{dp}$$

Rearrange to get

$$\frac{dq^*}{dp} = \frac{1}{C''(q^*)} > 0$$

1.3.3.3.2. So, the model predicts that when price increases q^* should increase as well.

- 1.3.3.4. One testable implication of the profit maximization model is that output should increase with output prices; if producers fail to increase output when price increases, the model can be rejected.
2. General features of economic models – most models, despite their variety, incorporate four common elements
 - 2.1. **Ceteris paribus assumption**
 - 2.1.1. To be useful, models are meant to portray simple relationships
 - 2.1.2. Economic models assume that many “outside” forces are held constant to keep the model simple
 - 2.1.3. We don’t assume that other factors don’t exist, just that they aren’t necessary to understand the variables modeled explicitly.
 - 2.1.4. The ceteris paribus assumption makes real-world validation difficult
 - 2.1.4.1. Imagine a simple model of gasoline demand: $d_g = a - b \cdot p_g$, where d_g is gasoline demand per month, in 1,000s of gallons, p_g is price per gallon, and $a, b > 0$
 - 2.1.4.1.1. What factors are being held constant in this model?
 - 2.1.4.1.2. What are the testable implications of this model?
 - 2.1.4.2. Suppose that, in one month, price is \$3.00 per gallon, and total consumption is 51,250 gallons; then in the next month, price goes up to \$3.50/gallon, but consumption increases to 51,500 gallons
 - 2.1.4.2.1. Does this observation invalidate the model?
 - 2.1.4.2.2. Why or why not?
 - 2.1.4.3. Controlled economic experiments are difficult to design and conduct, so we end up having to rely on statistical methods to control for outside forces

2.2. Structure of economic models