Intro to Macroeconmics: Problem Set II

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Abstract

This document contains the solutions to the problem set II.

1 Solutions to the problems

Question 1. Elasticity.

Solution. (1) We first note that elasticity in general is defined by

$$\epsilon_{q,p} = \frac{\frac{\triangle q}{q}}{\frac{\triangle p}{p}}.$$

The initial quantity, denoted as q_{B1}, can be explicitly computed by substituting the given values into the demand equation:

$$\begin{aligned} q_{B1} &= 220 - 5(100) + \frac{1}{2}(1000) + 120 - 2(70), \\ &= 200. \end{aligned}$$

The new quantity demanded, denoted as q_{B2}, can also be computed:

$$\begin{aligned} q_{B2} &= 220 - 5(102) + \frac{1}{2}(1000) + 120 - 2(70), \\ &= 190. \end{aligned}$$

Substituting the values into the elasticity equation, we have

$$\begin{aligned} \epsilon_{q,p} &= \frac{\frac{190-200}{200}}{\frac{102-100}{100}}, \\ &= -\frac{5}{2}. \end{aligned}$$

Hence, the price-elasticity is -2.5.

(2) The new quantity demanded can be computed as follows:

$$\begin{aligned} q_{B2} &= 220 - 5(100) + \frac{1}{2}(1000) + 140 - 140 \\ &= 220 \end{aligned}$$

Substituting the values into the elasticity equation, we have

$$\begin{aligned} \epsilon_{q,p} &= \frac{\frac{220-200}{200}}{\frac{140-120}{120}}, \\ &= \frac{3}{5}. \end{aligned}$$

Hence, the cross-elasticity is 0.6.

(3) The new quantity demanded can be computed as follows:

$$\begin{aligned} q_{B2} &= 220 - 5(100) + \frac{1}{2}(1000) + 120 - 120 \\ &= 220 \end{aligned}$$

Substituting the values into the elasticity equation, we have

$$\begin{aligned} \epsilon_{q,p} &= \frac{\frac{220-200}{200}}{\frac{60-70}{70}}, \\ &= -\frac{3}{5}. \end{aligned}$$

Hence, the cross-elasticity is -0.6.

(4) The new quantity demanded can be computed as follows:

$$\begin{aligned} q_{B2} &= 220 - 5(100) + \frac{1}{2}(1500) + 120 - 140 \\ &= 470 \end{aligned}$$

Substituting the values into the elasticity equation, we have

$$\begin{aligned} \epsilon_{q,p} &= \frac{\frac{470-200}{200}}{\frac{1500-1000}{1000}}, \\ &= 2.7. \end{aligned}$$

Hence, the income elasticity is 2.7.

Question 2. Production.

Solution. (1) We know that the Marginal Product of L and of K are respectively defined by $\frac{\partial F}{\partial L}$ and $\frac{\partial F}{\partial K}$.
Computing the above partials with the given production function, we obtain

$$\begin{aligned} \frac{\partial F}{\partial L} &= A, \\ \frac{\partial F}{\partial K} &= B, \end{aligned}$$

where A and B are strictly positive constants. Hence, the Marginal Product of L is A and the Marginal Product of K is B.

(2) With the above computation, we have shown that the marginal products are positive constants. Hence, the marginal products are constants. It is decreasing, but not strictly decreasing.

(3) The below figure contains the isoquants of production level 1 and 2 when $A = 2$ and $B = 5$.

Figure 1: Isoquants of Production levels