Intro to Macroeconmics: Problem Set II

Youngduck Choi, Noah Gentile, Yuliya Takh
New York University

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. As the cross-elasticity is positive, Barro's and Mankiw's books are complements.

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

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

Substituting the values into the elasticity equation, we have

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

Hence, the cross-elasticity is -0.6. As the cross-elasticity is negative, Barro's and the microeconomics books are complements.

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

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

Substituting the values into the elasticity equation, we have

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

Hence, the income elasticity is 2.7. When income increases, the quantity demanded goes up, so it is a normal good.

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

$$\frac{\partial F}{\partial L} = A,$$
$$\frac{\partial F}{\partial K} = B,$$

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 $B = 5$.

Question 3. The Impact of a Minimum Wage law.

Solution. (1)

(2)

(3)

Figure 1: Isoquants of Production levels