Microeconomic Theory: TA Session

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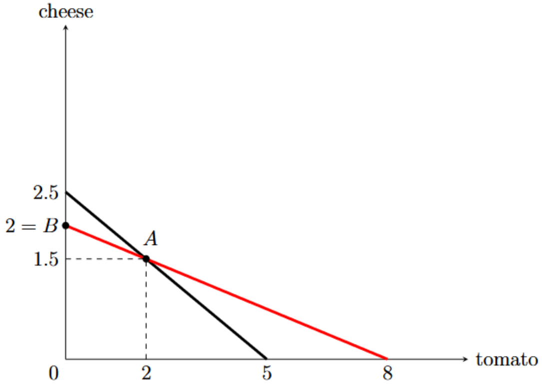
Assignment 1, Short Question 2

Jennifer has \$10 to spend on tomatoes and cheese. The price of a pound of tomatoes is \$2 and the price of a pound of cheese is \$4. She has found her utility-maximizing bundle at 2 pounds of tomatoes and 1.5 pounds of cheese. Suppose Jennifer's income falls to \$8 and the price of tomatoes falls to \$1. The price of cheese remains the same. Jennifer is considering a bundle of zero units of tomatoes and 2 units of cheese. What is your advice?

Revealed Preference

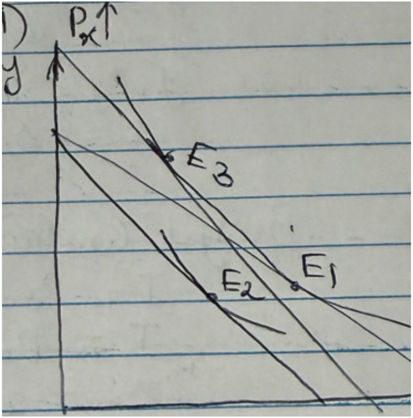
Revealed preference: the preferences of consumers can be revealed by their purchasing decisions

- Under the old budget constraint (the black solid line), both A and B are feasible, and Jennifer chose A. This means she must prefer A over B.



Assignment 1, Long Question 4

Draw the substitution effect and income effect for an inferior good when there is an increase in price



The income effect for an inferior good is positive when price increases!

Intertemporal choice

Consumer's choice of consumption over two periods of time

- The consumer's income in period 1 and 2 is m_1 and m_2
- The consumer can borrow or lend at an interest rate r
- The consumer chooses consumption c_1 and c_2

Intertemporal budget constraint

At the end of period 2, the consumer should have zero money left (and zero in debt, of course):

$$c_2 = (m_1 - c_1)(1 + r) + m_2$$

Rearranging, we can get either the present-value budget constraint:

$$c_1 + \frac{c_2}{1 + r} = m_1 + \frac{m_2}{1 + r}$$

Or the future-value budget constraint:

$$c_1(1 + r) + c_2 = m_1(1 + r) + m_2$$

These two budget constraints are equivalent

Intertemporal budget constraint

Here we use the future-value budget constraint as an example:

$$c_1(1+r)+c_2 = m_1(1+r)+m_2$$

The right hand side is the future value of the consumer's income

On the left hand side, if we think of the price of tomorrow's consumption as 1, then the price of today's consumption is $(1+r)$

- This is because today's 1 dollar is equivalent to tomorrow's $(1+r)$ dollars

So this is just a special form of our good old budget constraint $p_1x_1 + p_2x_2 = m$

- where $p_1 = 1+r,\ p_2 = 1,\ m = m_1(1+r)+m_2$

Then we can derive the optimal consumption bundle as in previous weeks

Intertemporal choice - exercise

A consumer's utility is given by $U = c_1^{0.5} c_2^{0.5}$. His endowment is $(m_1, m_2) = (100, 100)$, and the interest rate is $r_0 = 0.10$.

1. Derive the consumer's optimal c_1 and c_2.
2. Is the consumer a lender or a borrower?
3. Suppose the interest rate rises to $r_1 = 0.20$. Derive the consumer's new optimal c_1 and c_2.
4. Is the consumer better off as a result of the interest rate rise?

Intertemporal choice - answer

Answer:

1. $U = c_1^{0.5} c_2^{0.5}$ is equivalent to $U = c_1 c_2$. The intertemporal budget constraint is $c_1(1+r_0) + c_2 = m_1(1+r_0) + m_2 \;\Rightarrow\; 1.1c_1 + c_2 = 210$. The Lagrangian is $L = c_1 c_2 - \lambda(1.1c_1 + c_2 - 210)$. Using $\frac{\partial L}{\partial c_1} = 0,\; \frac{\partial L}{\partial c_2} = 0, \frac{\partial L}{\partial \lambda} = 0$, we have $c_1 = \frac{105}{1.1} = 95.45,\; c_2 = 105$
2. $c_1 = 95.45 < 100 = m_1$, the consumer is a lender.
3. Just redo question (1) with $r_1 = 0.20$. The new optimal consumption bundle is $c_1 = \frac{110}{1.2} \approx 91.67,\; c_2 = 110$
4. The utility under $r_0 = 0.10$ is $U_0 = c_1 c_2 = \frac{105}{1.1} \times 105 \approx 10022.73$. The utility under $r_1 = 0.20$ is $U_1 = c_1 c_2 = \frac{110}{1.2} \times 110 \approx 10083.33$. $U_0 < U_1$, the consumer is better off as a result of the rate rise.

Intertemporal choice - answer

A consumer is a borrower when interest rate is r_0. Suppose the interest rate falls to $r_1 < r_0$, and we observe that the consumer switches to being a lender. Can this happen? Why or why not?

Answer: This cannot happen. See graph on the next page with the old and new intertemporal budget constraints. Point E is the endowment, and A is the consumer's optimal choice under the old interest rate. By revealed preference, the consumer prefers A to everything in the interior of the budget constraint, including the pink segment in the graph.

Then, after the fall in interest rate, the consumer still prefers A to the pink segment. But A is now in the interior of the new budget constraint, so the consumer must also prefer somewhere on the red segment to A. That is to say, the new optimal consumption bundle will fall on the red segment instead of the pink segment of the new budget constraint — the consumer will remain a borrower.

Intertemporal choice - answer