Economics 101A
(Lecture 10, Revised)

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Outline

1. Labor Supply

2. Intertemporal choice
1 Labor Supply


- Labor supply decision: how much to work in a day.

- Goods: consumption good $c$, hours worked $h$

- Price of good $p$, hourly wage $w$

- Consumer spends $24 - h = l$ hours in units of leisure

- Utilify function: $u(c, l)$
• Budget constraint?

• Income of consumer: \( M + wh = M + w(24 - l) \)

• Budget constraint: \( pc \leq M + w(24 - l) \) or
  \[ pc + wl \leq M + 24w \]

• Notice: leisure \( l \) is a consumption good with price \( w \). Why?

• General category: opportunity cost

• Instead of enjoying one hour of TV, I could have worked one hour and gained wage \( w \).

• You should value the marginal hour of TV \( w \)!
Opportunity costs are very important!

Example 2. CostCo has a warehouse in SoMa

SoMa used to have low cost land, adequate for warehouses

Price of land in SoMa triples in 10 years.

Should firm relocate the warehouse?
• Did costs of staying in SoMa go up?

• No.

• Did the opportunity cost of staying in SoMa go up?

• Yes!

• Firm can sell at high price and purchase land in cheaper area.
• Let’s go back to labor supply

• Maximization problem is

\[
\max u(c, l) \\
\text{s.t. } pc + wl \leq M + 24w
\]

• Standard problem (except for 24w)

• First order conditions

• Assume utility function Cobb-Douglas:

\[
u(c, l) = c^\alpha l^{1-\alpha}\]
• Solution is

\[
c^* = \alpha \frac{M + 24w}{p}
\]

\[
l^* = (1 - \alpha) \left( 24 + \frac{M}{w} \right)
\]

• Both \( c \) and \( l \) are normal goods

• Unlike in standard Cobb-Douglas problems, \( c^* \) depends on price of other good \( w \)

• Why? Agents are endowed with \( M \) AND 24 hours of \( l \) in this economy

• Normally, agents are only endowed with \( M \)
2 Intertemporal choice

- So far, we assumed people live for one period only

- Now assume that people live for two periods:
  - $t = 0$ – people are young
  - $t = 1$ – people are old

- $t = 0$: income $M_0$, consumption $c_0$ at price $p_0 = 1$

- $t = 1$: income $M_1 > M_0$, consumption $c_1$ at price $p_1 = 1$

- Credit market available: can lend or borrow at interest rate $r$
• Budget constraint in period 1?

• Sources of income:
  
  - $M_1$
  
  - $(M_0 - c_0) \times (1 + r)$ (this can be negative)

• Budget constraint:

  \[
  c_1 \leq M_1 + (M_0 - c_0) \times (1 + r)
  \]

  or

  \[
  c_0 + \frac{1}{1 + r} c_1 \leq M_0 + \frac{1}{1 + r} M_1
  \]
• Utility function?

• Assume

\[ u(c_0, c_1) = U(c_0) + \frac{1}{1 + \delta} U(c_1) \]

• \( U' > 0, \ U'' < 0 \)

• \( \delta \) is the discount rate

• Higher \( \delta \) means higher impatience

• Elicitation of \( \delta \) through hypothetical questions

• Person is indifferent between 1 hour of TV today and 1 + \( \delta \) hours of TV next period
Maximization problem:

\[
\max U(c_0) + \frac{1}{1 + \delta} U(c_1)
\]
\[
s.t. \quad c_0 + \frac{1}{1 + r} c_1 \leq M_0 + \frac{1}{1 + r} M_1
\]

Lagrangean

First order conditions:

Ratio of f.o.c.s:

\[
\frac{U''(c_0)}{U''(c_1)} = \frac{1 + r}{1 + \delta}
\]
Case $r = \delta$

- $c_0^* c_1^*$?

- Substitute into budget constraint using $c_0^* = c_1^* = c^*$:

$$\frac{2 + r}{1 + r} c^* = \left[ M_0 + \frac{1}{1 + r} M_1 \right]$$

or

$$c^* = \frac{1 + r}{2 + r} M_0 + \frac{1}{2 + r} M_1$$

- We solved problem virtually without any assumption on $U$!

- Notice: $M_0 < c^* < M_1$

Case $r > \delta$

- $c_0^* c_1^*$?