

Midterm 1 Review

(1) Preferences and Utility; (2) The Rational Choice Model; (3) Demand; (4) Labor Supply

Welcome

Some Logistics

- **Midterm Exam #1** will take place **Tue, Oct 4 at 7pm (tonight!)**
- **Office Hours:** In-Person at **Chou N155** today from 11:10am - 12:30pm
- **Student Learning Center** has a **dedicated** team of **Econ 100A tutors**, located at Cesar Chavez Student Center
- **Practice Questions** are uploaded to econ100a.jacobwu.org
- Fill out the **Feedback Form** at the end of today's review session to receive the **Slide Deck**

Topic 1

Preferences and Utility

- Key Assumptions: Completeness, Transitivity, Monotonicity, Convexity
- Key Concepts: Utility Functions, Indifference Curves, MRS

$$\bullet \quad MRS = \frac{MU_1}{MU_2} = \frac{\frac{\partial U}{\partial x_1}}{\frac{\partial U}{\partial x_2}}$$

- Interpretation of $MRS = a$ is willingness (indifference) to trade each unit of x_1 for a units of x_2

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Practice: Course Pack Questions: T4Q2

- Calculate marginal rate of substitution for the following utility functions, and discuss in words what it implies about the person's preferences. L is leisure and c is dollars of consumption. [Hint: Let x_1 : Leisure and x_2 : Consumption]
- a) $u = c + 20L$
- b) $u = cL$

Solution: Course Pack Questions: T4Q2

- Calculate marginal rate of substitution for the following utility functions, and discuss in words what it implies about the person's preferences. L is leisure and c is dollars of consumption. [Hint: Let x_1 : Leisure and x_2 : Consumption]

a) $u = c + 20L$

$$MRS = \frac{MU_L}{MU_C} = \frac{20}{1} = 20$$

b) $u = cL$

$$MRS = \frac{MU_L}{MU_C} = \frac{c}{L}$$

Topic 2

The Rational Choice Model

- **Budget Constraint** $p_1x_1 + p_2x_2 \leq m$ where m indicates income
 - With intercepts at $(x_1, x_2) = (\frac{m}{p_1}, 0)$ and $(x_1, x_2) = (0, \frac{m}{p_2})$
- **Tangency:** $MRS = \frac{p_1}{p_2}$ [market rate of exchange (ability to swap, slope is equal to the consumer's private rate of exchange (willingness to swap, MRS)]
- **Substitutes** $u = ax_1 + bx_2$ **Cobb-Douglas** $u = x_1^c x_2^d$ or $u = c \ln x_1 + d \ln x_2$
- **Unusual Preferences** $u = \min\{x_1, x_2\}$ or $u = \max\{x_1, x_2\}$ or etc.

Practice: True or False

- (1) A convex indifference curve means a lower MRS when they have more of good 1 and less of good 2 (diminishing MRS) [Discuss]
- (2) Indifference curves cannot cross, otherwise transitivity is violated: $a \sim b$ and $b \sim c$ but $a \succ c$ [Vote]
- (3) $MRS = 0$ implies $u = x_2$ or $u = -x_2$, and indifference curves are horizontal lines. The consumer is never willing to give up any positive amount of x_2 to get any amount more of x_1 (in the case where they like x_2) [Discuss]
- (4) $MRS = \frac{p_1}{p_2}$ because otherwise the rate at which the consumer is willing to swap one good for the other is different from the rate at which they can actually swap one good for the other. For example, they may be willing to give up three units of good 1 for one unit of good 2, but they would actually only have to give up two units; they can reach a more preferred bundle by making that change [Vote]

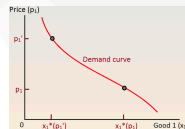
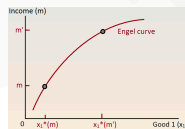
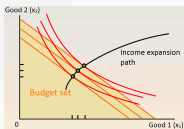
Solution: True or False

- All of them are true! Interpretation of $MRS = a$ is willingness (indifference) to trade each unit of x_1 for a units of x_2 . If you're not sure, try drawing a diagram for parts (1) and (3) or come visit office hours!

Topic 3 Demand

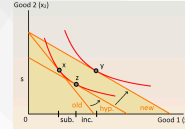
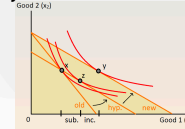
- Change in Income: **Income Expansion Path** and **Engel Curve**; *Normal and Inferior Goods*
- Change in Price: **Offer Curve** and **Demand Curve**; *Ordinary, Giffen and Veblen Goods; Substitutes and Complements*
- Income Effect vs. Substitution Effect: **Slutsky Decomposition** vs. **Hicks Decomposition**; *x-to-z is substitution effect and z-to-y is income effect*

• **Price Elasticity** $\epsilon_{x_1, p_1} = - \frac{\partial x_1}{\partial p_1} \frac{p_1}{x_1}$



Using m hypothetical to make original bundle just as affordable

Using same indifference curve to keep utility the same



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Practice: What Kind of Goods

- A household has a maximum monthly expenditure on food at \$400 and a minimum consumption of grains at 50 kg. The household consumes two goods to meet their grain consumption demand: rice and wheat.
 - Is rice considered a normal good, an inferior good, or can we not say? Is rice considered an ordinary good, a giffen good, a veblen good, or can we not say?
 - Is wheat is considered a normal good, an inferior good, or can we not say? Is wheat considered an ordinary good, a giffen good, a veblen good, or can we not say?
 - Are rice and wheat considered substitutes, complements, neither, or can we not say?

Good	Price Of Good (per kg)	Quantity Demanded (kg)	Expenditure
Rice	\$5.00	40	\$200.00
Wheat	\$20.00	10	\$200.00
Total Expenditure:			\$400.00

When the price of rice increases to \$6, the current bundle would cost \$440:

Good	Price Of Good (per kg)	Quantity Demanded (kg)	Expenditure
Rice	\$6.00	40	\$240.00
Wheat	\$20.00	10	\$200.00
Total Expenditure:			\$440.00

To keep total expenditure at \$400 and meet its consumption level of 50 kg, it buys more rice and less wheat:

Good	Price Of Good (per kg)	Quantity Demanded (kg)	Expenditure
Rice	\$6.00	43	\$258.00
Wheat	\$20.00	7	\$140.00
Total Expenditure:			\$398.00

This is a Hicks Decomposition!

Solution: What Kind of Goods

- A household has a maximum monthly expenditure on food at \$400 and a minimum consumption of grains at 50 kg. The household consumes two goods to meet their grain consumption demand: rice and wheat.
 - Is rice considered a normal good, an inferior good, or can we not say? Is rice considered an ordinary good, a giffen good, a veblen good, or can we not say?
 - Is wheat is considered a normal good, an inferior good, or can we not say? Is wheat considered an ordinary good, a giffen good, a veblen good, or can we not say?
 - Are rice and wheat considered substitutes, complements, neither, or can we not say?

X (Original)

Good	Price Of Good (per kg)	Quantity Demanded (kg)	Expenditure
Rice	\$5.00	40	\$200.00
Wheat	\$20.00	10	\$200.00
Total Expenditure:			\$400.00

Rice and wheat are substitutes since they both meet the same need (grain consumption)

When the price of rice increases to \$6, the current bundle would cost \$440:

Y (New)

Good	Price Of Good (per kg)	Quantity Demanded (kg)	Expenditure
Rice	\$6.00	40	\$240.00
Wheat	\$20.00	10	\$200.00
Total Expenditure:			\$440.00

To keep total expenditure at \$400 and meet its consumption level of 50 kg, it buys more rice and less wheat:

Z (Hypothetical)

Good	Price Of Good (per kg)	Quantity Demanded (kg)	Expenditure
Rice	\$6.00	43	\$258.00
Wheat	\$20.00	7	\$140.00
Total Expenditure:			\$398.00

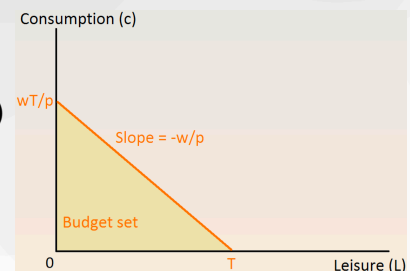
z-to-y is income effect, so rice is inferior and wheat is normal; x-to-z is substitution effect, so rice is giffen since you buy more when price increase and rice is not luxury so not Veblen, wheat does not experience price change so we cannot say.

Topic 4 Labor Supply

- Good 1: Leisure L , with per-unit price of wage rate w
- Good 2: Consumption C , with per-unit price of p | Budget constraint: Time
- $pc \leq w\ell$ (E4.1) since total consumption cannot exceed total income
- $\ell + L = T$ (E4.2) where ℓ is hours worked and L is leisure, T is total time
- $wL + pc \leq wT$ (E4.3) by combining E4.1 and E4.2

$$MRS = \frac{MU_L}{MU_C} \quad (\text{E4.4}) \quad MRS = \frac{w}{p} \quad (\text{E4.5}) \quad c = \frac{m}{p} \quad (\text{E4.7})$$

$$\frac{MU_L}{MU_C} = \frac{w}{p} \quad (\text{E4.6}) \quad \text{by combining E4.4 and E4.5}$$



Practice: Course Pack T4Q5

- Jim is deciding how many hours to work. His well-behaved preferences depend on leisure (L) and consumption (c) according to the utility function $u = c^2L$. He has 12 total hours available. The price of each unit of consumption is $p = 1$ and the wage rate is $w = 5$.
- (c) What is Jim's optimal choice of c and L ? How many hours will he work?

- (d) Say that in addition to the job with hourly wage \$5 that we considered so far, there is another possible job available to Jim. This alternative job is salaried, and so he has no discretion about how many hours to work. It pays \$50 and he must work for 10 hours. If he must choose either the wage job or the salaried job, which will he choose and why?

Solution: Course Pack T4Q5

- Jim is deciding how many hours to work. His well-behaved preferences depend on leisure (L) and consumption (c) according to the utility function $u = c^2L$. He has 12 total hours available. The price of each unit of consumption is $p = 1$ and the wage rate is $w = 5$.
- (c) What is Jim's optimal choice of c and L ? How many hours will he work?

$$MRS = \frac{MU_L}{MU_C} \stackrel{\text{set}}{=} \frac{w}{p}$$

$$\frac{c^2}{2cL} = \frac{w}{p}$$

$$c = \frac{w}{p}(2L) = 10L$$

$$wL + pc \leq wT$$

$$5L + 10L \leq 12 \cdot 5$$

$$L^* = \frac{60}{15} = 4$$

$$c^* = 10L^* = 40$$

- (d) Say that in addition to the job with hourly wage \$5 that we considered so far, there is another possible job available to Jim. This alternative job is salaried, and so he has no discretion about how many hours to work. It pays \$50 and he must work for 10 hours. If he must choose either the wage job or the salaried job, which will he choose and why?

$$u_c = (c_c)^2 L_c = 40^2 \cdot 4 = 6400$$

$$u_d = (c_d)^2 L_d = 50^2 \cdot (12 - 10) = 5000$$

Since $u_c > u_d$, we conclude Jim prefers the hourly job (from part c)