NU Econ 101: Lecture 2

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Where are we now?

1. Positive and normative
2. Assumptions, models, and implications
3. Utility functions ctd.
4. Forward

Positive and normative economics

What is economics as a *positive science*?

- "a body of systematized knowledge corncerning **what is**."

What is economics as a *normative science*?

- "a body of systematized knowledge corncerning **what ought to be**."

An example: raising the minimum wage

We ask four voters about increasing the minimum wage (mw):

	Anne	Bob	Claude	Dave
				
Positive Increasing the mw. . .	helps the poor!	hurts the poor!	helps the poor!	hurts the poor!
Normative We should. . .	help the poor!	help the poor!	hurt the poor!	hurt the poor!
Support	Yes	No	No	Yes

Friedman: We tend to agree on the normative, argue on the positive, i.e., most of us are Anne or Bob.

Positive and normative in Kazakhstan

The **normative** of most economic issues in KZ is some version of improve the economy, increase growth, decrease inequality, etc.

The **positive** of a few economic issues might be things like:

- Eurasian Economic Union
  - *for*: Facilitates increased trade, economic growth
  - *against*: Cheap imports damage KZ manufacturing
- Floating the tenge
  - *for*: Helps KZ exporters
  - *against*: Decreases real wealth of consumers
- Labor market liberalization
  - *for*: Helps KZ firms
  - *against*: Reduces protections for employees

Positive economics

Friedman on theory:

The ultimate goal of a positive science is the development of theory that yields predictions about phenomena not yet observed.

Theory is:

- a language designed to promote systematic and organized methods of reasoning.
- a body of substantive hypotheses designed to abstract essential features of a complex reality.

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Assumptions, models, and implications

Assumptions $\Longrightarrow$ Model $\Longrightarrow$ Implications

- Assumption
  - a thing that is accepted as true without proof.
- Model
  - a simplified description of a system or process.
- Implication
  - a conclusion that can be drawn.

Friedman's examples

- **The law of falling bodies**
  - Assumption: We are in a vacuum.
  - Model: An object falling in a vacuum.
  - Implications: Acceleration of a body dropped is g and distance is $s = \frac{1}{2}gt^2$.
- **Density of leaves on a tree**
  - Assumption: Leaves make decisions and are very smart.
  - Model: A bunch of little decision-making leaves picking locations on a tree.
  - Implication: Leaves are positioned as if each sought to maximize its amount of sunlight.

How do we judge models? (1)

The wrong question:

- Is the model right?
  - A model yields its implications through tautologies.
    - tautology: a statement that is true by necessity or by virtue of its logical form.

The right question:

- Is the model right for (relevant to) a question of interest?

An example:

$$\text{Area of a triangle} = \frac{1}{2} \cdot \text{base} \cdot \text{height}$$

- You use this formula to incorrectly calculate the area of a square. Was the model (and its implication) wrong?

How do we judge models? (2)

For a given question or phenomenon, one model may be more appropriate than another if its implications appear more consistent with observed phenomena.

- We might believe the model to be a better predictor of future (as-yet-unobserved) phenomena.

But can we also judge models based on the realism of their assumptions?

- Given Friedman's examples: Not necessarily.

Realism in assumptions (1)

The degree to which assumptions are unrealistic matters insofar as it affects the model's ability to predict future phenomena.

- Density of leaves on a tree
  - Ludicrous assumption, but model very predictive.
- Falling bodies
  - Questionable assumption (vacuum), but model still predictive (depending on specific question of interest).

Realism in assumptions (2)

Realism in assumptions does matter. Consider my model:

- Goal: Predict winner of 2016 presidential election.
- Assumption: All hispanics vote for Donald Trump.
- Implication: Donald Trump wins the election.

The problem:

- Assumption is very unrealistic.
- Assumption is critical in yielding the implication.

Consequence: Model is not a good predictor relative to the goal.

- Model not *wrong*, just not applicable to the given goal.

Our two models so far (1)

Model 1: Preferences and utility functions

- Goal: Analyze how people make decisions.
- Assumption: People have *rational* preferences.
- Implication: People make decisions *as if* they were maximizing a utility function.

Our two models so far (2)

Model 2: Neoclassical economics

- Goal: Determine which goods are produced, at what quantities, sold at what prices in markets through supply and demand.
- Assumptions: Consumers maximize utility functions (among other assumptions we will see).
- Implications: We will find out!

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What is a util?

Utility is a relative measure.

- $u_i(1 \text{ gun}) = 2$ has no meaning by itself.
- However, combine that with $u_i(1 \text{ lollipop}) = 1$ and we can conclude that 1 gun $\succ_i$ 1 lollipop.

Differences are also relative (assuming cardinal utility).

- $u_i(1 \text{ gun}) - u_i(1 \text{ lollipop}) = 1$ has no meaning by itself.
  - Besides 1 gun $\succ$ 1 lollipop, of course.
- Combine it with $u_i(1 \text{ submarine}) - u_i(1 \text{ gun}) = 2$ and we can conclude that i's preference for the submarine over the gun is stronger than her preference for the gun over the lollipop.

Most measures are peculiar...

How long is a meter/metre?

- 1793: One ten-millionth of the distance from the equator to the North Pole.
- 1889: As long as a prototype metre bar (changed twice).
- 1960: Redefined in terms of a certain number of wavelengths of a certain emission line of krypton-86.
- 1983: Distance traveled by light in $\frac{1}{299792458}$ of a second.

Normalization

Agent i tells us that:

- 1 submarine $\succ_i$ 1 gun $\succ_i$ 1 lollipop
- The difference between the submarine and the boat is twice that of the difference between the gun and the lollipop.

All of the following are accurate utility representations:

$x =$	lollipop	gun	submarine	
$u_i(x)$	1	2	4	$\leftarrow$ simplest!
$u_i'(x)$	2	4	8	
$u_i''(x)$	20	100	260	
$u_i'''(x)$	0.3	0.4	0.6	
$u_i''''(x)$	-5	-4	-2	

Might as well go with the simplest...

What is the domain of a utility function?

$$u_i : X \to \mathbb{R}$$

X is called the **consumption set**.

What the consumption set is depends on our model:

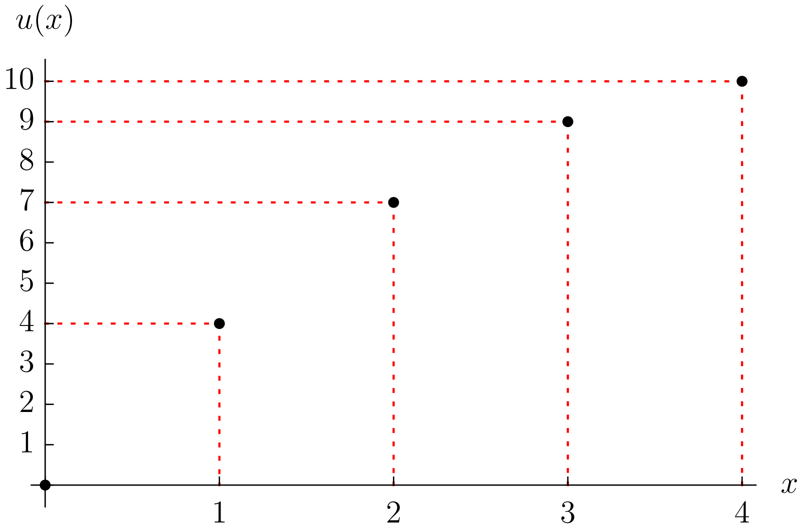
- i consumes only guns (indivisible). Then $X = \mathbb{N}$.
  - i.e. $X = \{0, 1, 2, 3, \ldots\}$, e.g. $x = 2$
- i consumes only water (divisible). Then $X = \mathbb{R}_+$.
  - i.e. $X = [0, \infty)$, e.g. $x = 1.792$
- i consumes L divisible goods. Then $X = \mathbb{R}_+^L$.
  - i.e. $X = [0, \infty)^L$, e.g. $x = (0.7, 74.1, \ldots)$

Utility function with one good

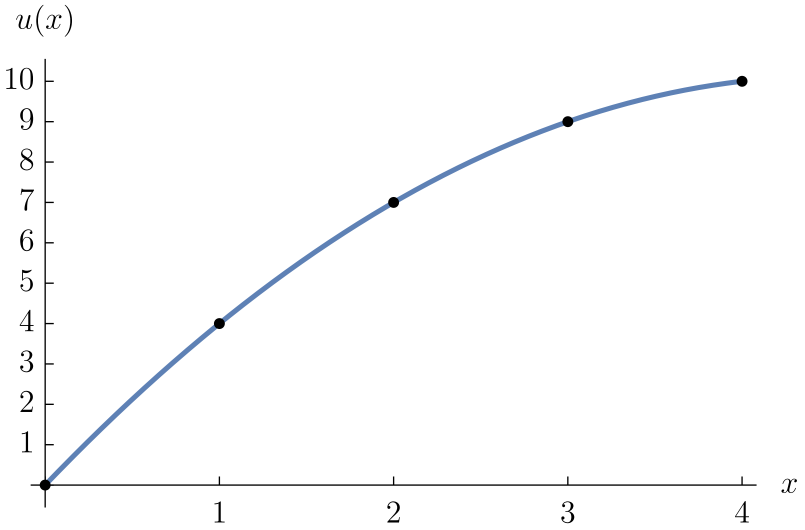
Let x denote the quantity of a good and $u(x)$ the utility from x units of the good.

x	$u(x)$
0	0
1	4
2	7
3	9
4	10

Plotting a utility function (1)



Plotting a utility function (2)



Marginal utility with an indivisible good (1)

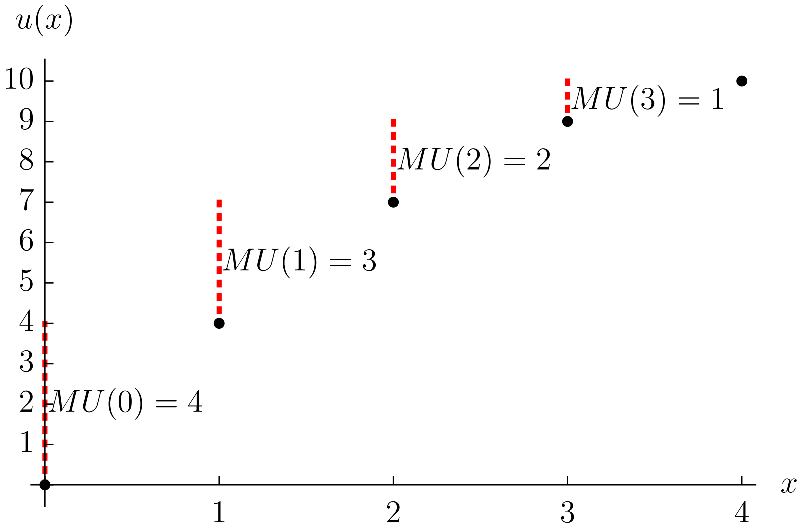
Let $MU(x)$ denote the marginal utility of the indivisible good at quantity x. (Possible quantities of indivisible goods: $0, 1, 2, \ldots$)

x	$u(x)$	$MU^F(x)$	$\mathbf{MU^B(x)}$
0	0	4	
1	4	3	4
2	7	2	3
3	9	1	2
4	10		1

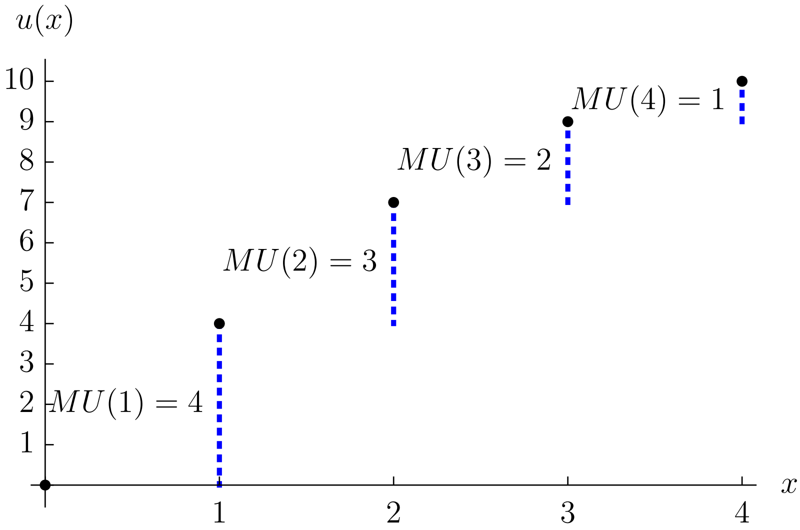
Marginal Utility

- Forward marginal utility ($MU^F(x)$): The additional satisfaction gained from one more unit of a good: $MU^F(x) = u(x+1) - u(x)$.
- **Backward marginal utility** ($MU^B(x)$): The additional satisfaction gained from the current last unit: $MU^B(x) = u(x) - u(x-1)$.

Forward marginal utility ($MU^F(x)$)



Backward marginal utility ($MU^B(x)$)



Marginal utility with a divisible good (1)

Now suppose we have an infinitely divisible good. (Possible quantities of divisible goods: any non-negative real number)

Suppose $u(x) = \sqrt{x}$. We can still check values at a few points:

x	$u(x)$
0	0
1	1
4	2
9	3
16	4

Marginal utility with a divisible good (2)

Now, we can consider arbitrarily small differences in consumption. So instead of:

$$MU(x) = u(x) - u(x-1),$$

we *roughly* (hence the $\sim$ on top) want to say:

$$\tilde{MU}(x) = u(x) - u(x-\varepsilon)$$

with $\varepsilon > 0$ and as small as possible. But if we take the limit of this as ε gets smaller and smaller (towards zero). We get:

$$\lim_{\varepsilon \to 0} \tilde{MU}(x) = \frac{du(x)}{dx}(x) \equiv MU(x)$$

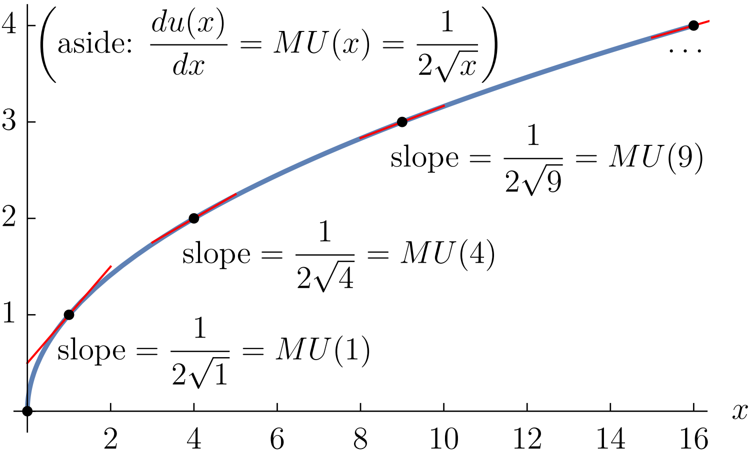
Marginal utility with a divisible good (3)

For divisible goods, **the marginal utility function is the derivative of the utility function**.

- If the last slide didn't make sense to you, do not worry. When I want to use $MU(x)$, I will give it to you (same for all derivatives in this course).

Marginal utility with a divisible good (4)

$u(x) = \sqrt{x}$



Marginal utility with a divisible good (5)

On previous slide, $MU(x)$ is the slope of the blue line as it goes through the point $(x, u(x))$. I have drawn red lines to illustrate.

The Law of Diminishing Marginal Utility

Rough Defn: At some point, $MU(x)$ starts decreasing in x.

- Even rougher: You get tired of stuff...

Why we have it: It means you won't consume just one good.

Why it's dumb:

- It's more of an assumption than a *law*.
- It's not *really* what we need to conclude that you consume more than just one good.
  - Instead, we want *diminishing MRS*, to be defined later.

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Next time

Next class: Tomorrow

Reading: Three sections in Chapter 6:

- Household Choice in Output Markets
- The Basis of Choice: Utility
- Appendix on Indifference Curves

Plan:

- More on utility functions
  - Now with two goods!
  - Indifference curves
  - Marginal rate of substitution (MRS)
- Budget constraints
- Opportunity costs