The Theory of the Consumer

- Model of individual choice:
  - “Consumers choose the best bundle of goods and services that they can afford.”
- 1) “afford”: depends upon opportunities / budget constraints
- 2) “best”: depends upon preferences
- 3) “choose”: assumes optimizing (goal oriented) behavior

Budget Constraints

- A consumer must choose among bundles of goods: \((x_1, x_2, \ldots, x_n)\) example: (fish, beef, milk, CDs, books).
- Each good has a price: \((p_1, p_2, \ldots, p_n)\).
- The consumer has income \(I\) to spend on goods.

Two Good Case

- Consider the case of 2 goods \((x_1, x_2)\) (e.g., video games, baby food). Let’s say the price of these goods are \(p_1, p_2\).
- A bundle \((x_1, x_2)\) is affordable (in the budget set) if and only if \(p_1 x_1 + p_2 x_2 \leq I\).
- The set of affordable bundles is the budget set.

Budget Set

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Budget Line

- The budget line intersects the \(x_1\) axis at \(I/p_1\)
- The budget line intersects the \(x_2\) axis at \(I/p_2\)
- The slope of the budget line is \(-p_1/p_2\)
- How do you show this?
  * \(p_1 x_1 + p_2 x_2 = I\)
  * \(x_2 = \frac{I}{p_2} - \frac{p_1}{p_2} x_1\)
- The consumer can buy only positive amounts of goods, so \(x_1 \geq 0\) and \(x_2 \geq 0\)

Budget Line ‘Facts’

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Example: Determining the Budget Line
- $x_1$ = houses (not in L.A.)
- $p_1 = $35,000
- $x_2$ = BMWs
- $p_2 = $70,000
- $I = $140,000

What Does the Budget Line Tell Us?
- The ‘opportunity cost’ of consuming an additional unit of good 1 in terms of lost consumption of good 2.

Budget Constraints with More than Two Goods
- We can expand the bundle of goods to three or more goods
  - Budget line: $p_1x_1 + p_2x_2 + p_3x_3 = I$
  - $N$ goods: $\sum_{i=1}^{N} p_ix_i = I$
- Often, we define good 2 as a composite good (i.e., all other goods)
  - e.g.: $x_1$ = grad school, $x_2$ = all other goods

The Effect of a Price Change on the Budget Line
- Price of $x_2$ falls
- Price of $x_1$ rises

The Effect of a Change in Income on the Budget Line
- Income Falls
- Income Rises

What Happens if the Prices of Both Goods Double?
- The effect is the same as if income were cut in half.
  \[ x_1(2p_1) + x_2(2p_2) = I \]
  \[ x_1p_1 + x_2p_2 = \frac{I}{2} \]
- What would happen if both prices and income double?
Budget ‘Lines’ Can Be Nonlinear

- Up to now, we have only considered budget lines when there are fixed and non-variable prices.
- In some applications, such an assumption may not apply.
- Examples:
  - Progressive income taxes
  - Volume discounts
  - Food stamps (and other welfare programs)

Volume Discounts

- The first \( d \) units of \( x_1 \) cost \( p_1 \)
- Any units after \( d \) cost \( p_1/2 \)

Food Stamps

- 2 goods, food and housing, with prices $1 and $2 respectively.
- Income is equal to $50
- The consumer has a coupon (which can’t be sold) worth $10 of food
  - draw budget constraint
  - how much does it cost to trade food for housing (with and without the coupon)

Food Stamps Budget Constraint

Revealed Preference

- A careful analysis of budget constraints can lead to powerful predictions about consumer behavior.
- A good example of this is revealed preference analysis.
- Using just budget constraints and observed choices, we can prove that demand curves slope downward.

Axiom of Revealed Preference

- Intuitive explanation of the axiom of revealed preference:
  - Given price and income, if two bundles of goods (say A and B) are available to a consumer and he chooses A, then A will never be chosen over B no matter what prices and income.
  - If the consumer chooses B, then A must not be affordable, given prices and income.
Graphical Demonstration of Revealed Preference

The consumer facing budget line $I_1$ picks good bundle A over good bundle B.

Graphical Demonstration (II)

Now, facing constraint $I_2$, the consumer still prefers A to B. Presumably he would prefer any bundle between C and D to A, since those bundles have more of both $x_1$ and $x_2$.

Graphical Demonstration (III)

Finally, facing constraint $I_3$, the consumer might choose bundle B. But that is only because bundle A is not available.

Downward Sloping Demand

- Suppose we observe that a consumer is indifferent between two bundles of goods, C and D. The goods are X and Y.
- Suppose that C is chosen when prices are: $(p_X^C, p_Y^C)$
- Suppose that D is chosen when prices are: $(p_X^D, p_Y^D)$

Downward Sloping Demand (II)

- Since the consumer is indifferent between C and D, when C is chosen, D must cost at least as much (and perhaps more) than C: $p_X^C X_C + p_Y^C Y_C \leq p_X^D X_D + p_Y^D Y_D$.
- Similarly, when D is chosen, C must cost at least as much (and perhaps more) than D: $p_X^D X_D + p_Y^D Y_D \leq p_X^C X_C + p_Y^C Y_C$.

Downward Sloping Demand (III)

- Adding these two equations together and combining terms yields: $(p_X^C - p_X^D) (X_C - X_D) + (p_Y^C - p_Y^D) (Y_C - Y_D) \leq 0$.
- If the price of Y is fixed then: $(p_X^C - p_X^D) (X_C - X_D) \leq 0$.
- This means that, holding all else except $p_X$ fixed, price and quantity move in opposite directions—downward sloping demand.