Chapter 3

Consumer Behavior
Introduction

- How are consumer preferences used to determine demand?
- How do consumers allocate income to the purchase of different goods?
- How do consumers with limited income decide what to buy?
Consumer Behavior

- There are three steps involved in the study of consumer behavior

1. *Consumer Preferences*
   - To describe how and why people prefer one good to another

2. *Budget Constraints*
   - People have limited incomes
Consumer Behavior

3. Given preferences and limited incomes, what amount and type of goods will be purchased?
   - What combination of goods will consumers buy to maximize their satisfaction?
Consumer Preferences

- How might a consumer compare different groups of items available for purchase?
- A *market basket* is a collection of one or more commodities
- Individuals can choose between market baskets containing different goods
Consumer Preferences – Basic Assumptions

1. Preferences are complete
   - Consumers can rank market baskets

2. Preferences are transitive
   - If they prefer A to B, and B to C, they must prefer A to C

3. Consumers always prefer more of any good to less
   - More is better (MIB)
Consumer Preferences

- Consumer preferences can be represented graphically using *indifference curves*.

- Indifference curves represent all combinations of market baskets that the person is *indifferent to*.
  - A person will be equally satisfied with either choice.
## Indifference Curves: Market Basket (collection of commodities)

<table>
<thead>
<tr>
<th>Market Basket</th>
<th>Units of Food</th>
<th>Units of Clothing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>D</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>E</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>G</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>H</td>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>
The consumer prefers A to all combinations in the yellow box, while all those in the pink box are preferred to A.
Indifference Curves: An Example

- Indifferent between points B, A, & D
- E is preferred to points on $U_1$
- Points on $U_1$ are preferred to H & G
Indifference Curves

- Any market basket lying northeast of an indifference curve is preferred to any market basket that lies on the indifference curve.
- Points on the curve are preferred to points southwest of the curve.
Indifference Curves

- Indifference curves slope downward to the right
  - If they sloped upward, they would violate the assumption of MIB
Indifference Curves

- Indifference curves cannot cross.
Indifference Maps

- B is preferred to D
- A is indifferent to B & D
- B must be indifferent to D but that can’t be if B is preferred to D
Indifference Map

Market basket A is preferred to B. Market basket B is preferred to D.
Observation: The amount of clothing given up for 1 unit of food decreases from 6 to 1.
We measure how a person trades one good for another using the *marginal rate of substitution (MRS)*

- It quantifies the amount of one good a consumer will give up to obtain more of another good
- It is measured by the slope of the indifference curve
Marginal Rate of Substitution

\[ MRS = -\frac{\Delta C}{\Delta F} \]
Marginal Rate of Substitution

- Indifference curves are convex
  - As more of one good is consumed, a consumer would prefer to give up fewer units of a second good to get additional units of the first one
- Consumers generally prefer a balanced market basket
- The MRS decreases as we move down the indifference curve
Marginal Rate of Substitution

- Indifference curves with different shapes imply a different willingness to substitute
- Two polar cases are of interest
  - Perfect substitutes
  - Perfect complements
Consumer Preferences

Perfect Substitutes

Apple Juice (glasses)

Orange Juice (glasses)
Consumer Preferences

Perfect Complements
Consumer Preferences

- We have assumed all our commodities are “goods”
- There are commodities we don’t want more of - bads
  - Things for which less is preferred to more
- Examples: Air pollution, working hours
- We redefine the commodity
Consumer Preferences: An Application

These consumers place a greater value on performance than styling.
Consumer Preferences:
An Application

These consumers place a greater value on styling than performance.
Utility

- A numerical score representing the satisfaction that a consumer gets from a given market basket
- If buying 3 copies of *Microeconomics* makes you happier than buying one shirt, then we say that the books give you more utility than the shirt
Utility

- **Utility function**
  - Formula that assigns a level of utility to individual market baskets
  - If the utility function is
    \[ U(F, C) = F + 2C \]
    A market basket with 8 units of food and 3 units of clothing gives a utility of
    \[ 14 = 8 + 2(3) \]
## Utility - Example

<table>
<thead>
<tr>
<th>Market Basket</th>
<th>Food</th>
<th>Clothing</th>
<th>Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8</td>
<td>3</td>
<td>$8 + 2(3) = 14$</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>4</td>
<td>$6 + 2(4) = 14$</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>4</td>
<td>$4 + 2(4) = 12$</td>
</tr>
</tbody>
</table>

Consumer is indifferent between A & B and prefers both to C
Utility - Example

<table>
<thead>
<tr>
<th>Basket</th>
<th>U = FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>25 = 2.5(10)</td>
</tr>
<tr>
<td>A</td>
<td>25 = 5(5)</td>
</tr>
<tr>
<td>B</td>
<td>25 = 10(2.5)</td>
</tr>
</tbody>
</table>

Basket $U = FC$

- C: $25 = 2.5(10)$
- A: $25 = 5(5)$
- B: $25 = 10(2.5)$

Graph:
- Clothing
- Food
- Points: A, B, C
- Contours: $U_1 = 25$, $U_2 = 50$, $U_3 = 100$
Utility

- Although we numerically rank baskets and indifference curves, numbers are **ONLY** for ranking.
- A utility of 4 is not necessarily twice as good as a utility of 2.
- There are two types of rankings:
  - Ordinal ranking
  - Cardinal ranking
Utility

- **Ordinal Utility Function**
  - Places market baskets in the order of most preferred to least preferred, but it does not indicate how much one market basket is preferred to another

- **Cardinal Utility Function**
  - Utility function describing the extent to which one market basket is preferred to another
Budget Constraints

- Preferences do not explain all of consumer behavior
- Budget constraints also limit an individual’s ability to consume in light of the prices they must pay for various goods and services
Budget Constraints

● The Budget Line
  ● Indicates all combinations of two commodities for which total money spent equals total income
  ● We assume only 2 goods are consumed, so we do not consider savings
The Budget Line

- Let F equal the amount of food purchased, and C is the amount of clothing.
- Price of food = $P_F$ and price of clothing = $P_C$.
- Then $P_FF$ is the amount of money spent on food, and $P_C^C$ is the amount of money spent on clothing.
The budget line then can be written:

\[ PF \cdot F + Pc \cdot C = I \]

All income is allocated to food (F) and/or clothing (C)
The Budget Line

- Different choices of food and clothing can be calculated that use all income
  - These choices can be graphed as the budget line
- Example:
  - Assume income of $80/week, \( P_F = \$1 \) and \( P_C = \$2 \)
## Budget Constraints

<table>
<thead>
<tr>
<th>Market Basket</th>
<th>Food $P_F = $1</th>
<th>Clothing $P_C = $2</th>
<th>Income $I = P_F F + P_C C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>40</td>
<td>$80</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>30</td>
<td>$80</td>
</tr>
<tr>
<td>D</td>
<td>40</td>
<td>20</td>
<td>$80</td>
</tr>
<tr>
<td>E</td>
<td>60</td>
<td>10</td>
<td>$80</td>
</tr>
<tr>
<td>G</td>
<td>80</td>
<td>0</td>
<td>$80</td>
</tr>
</tbody>
</table>
The Budget Line

The slope of the budget line is given by:

$$Slope = \frac{\Delta C}{\Delta F} = \frac{1}{2} = \frac{P_F}{P_C}$$

where $\Delta C$ is the change in clothing, $\Delta F$ is the change in food, $P_F$ is the price of food, and $P_C$ is the price of clothing.
Budget Constraints

- The Budget Line
  - The vertical intercept, $I/P_C$, illustrates the maximum amount of C that can be purchased with income I
  - The horizontal intercept, $I/P_F$, illustrates the maximum amount of F that can be purchased with income I
The Budget Line

\[ P_F F + P_C C = I \]

\[ P_C C = I - P_F F \]

\[ C = \frac{I}{P_C} - \frac{P_F}{P_C} F \]
The Budget Line

- As consumption moves along a budget line from the intercept, the consumer spends less on one item and more on the other.
- The slope of the line measures the relative cost of food and clothing.
- The slope is the negative of the ratio of the prices of the two goods.
- The slope indicates the rate at which the two goods can be substituted without changing the amount of money spent.
The Budget Line

- As we know, income and prices can change.
- As incomes and prices change, there are changes in budget lines.
- We can show the effects of these changes on budget lines and consumer choices.
The Budget Line - Changes

An increase in income shifts the budget line outward.

A decrease in income shifts the budget line inward.
The Budget Line - Changes

An increase in the price of food to $2.00 changes the slope of the budget line and rotates it inward.

A decrease in the price of food to $.50 changes the slope of the budget line and rotates it outward.

<table>
<thead>
<tr>
<th>Food (units per week)</th>
<th>Clothing (units per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>120</td>
<td>40</td>
</tr>
<tr>
<td>160</td>
<td>40</td>
</tr>
</tbody>
</table>

\( L_3 \) \( (P_F = 2) \)

\( L_1 \) \( (P_F = 1) \)

\( L_2 \) \( (P_F = 1/2) \)
The Budget Line - Changes

- The Effects of Changes in Prices
  - If the two goods decrease in price, but the ratio of the two prices is unchanged, the slope will not change.
  - However, the budget line will shift **outward** parallel to the original budget line.
Consumer Choice

- Given preferences and budget constraints, how do consumers choose what to buy?
- Consumers choose a combination of goods that will maximize their satisfaction, given the limited budget available to them.
Consumer Choice

- A, B, C on budget line
- D highest utility but not affordable
- C highest affordable utility
- Consumer chooses C
Consumer Choice

- Consumer will choose highest indifference curve on budget line
- In previous graph, point C is where the indifference curve is just tangent to the budget line
- Slope of the budget line equals the slope of the indifference curve at this point
Recall, the slope of an indifference curve is:

\[ MRS = -\frac{\Delta C}{\Delta F} \]

Further, the slope of the budget line is:

\[ Slope = -\frac{P_F}{P_C} \]
Consumer Choice

Therefore, it can be said at consumer’s optimal consumption point,

\[ MRS = \frac{P^F}{P^C} \]
Consumer Choice

- It can be said that satisfaction is maximized when *marginal rate of substitution* (of F and C) is equal to the *ratio of the prices* (of F and C).
- Note this is ONLY true at the optimal consumption point.
Consumer Choice

- If MRS ≠ \( \frac{P_F}{P_C} \) then individuals can reallocate basket to increase utility
- If MRS > \( \frac{P_F}{P_C} \)
  - Will increase food and decrease clothing until MRS = \( \frac{P_F}{P_C} \)
- If MRS < \( \frac{P_F}{P_C} \)
  - Will increase clothing and decrease food until MRS = \( \frac{P_F}{P_C} \)
Point B does not maximize satisfaction because the MRS = \(-\frac{10}{10} = 1\) is greater than the price ratio = \(\frac{1}{2}\)
Point B does not maximize satisfaction because the MRS = \(-10/10 = 1\) is greater than the price ratio \(= 1/2\).
A Corner Solution

A corner solution exists at point B.
A Corner Solution

- When a corner solution arises, the consumer’s MRS does not necessarily equal the price ratio.

- In this instance it can be said that:

\[ MRS \geq \frac{P_{\text{IceCream}}}{P_{\text{Frozen Yogurt}}} \]
A Corner Solution - Example

- Suppose Jane Doe’s parents set up a trust fund for her college education
- The money must be used only for education
- Although a welcome gift, an unrestricted gift might be better
A Corner Solution - Example

- Original budget line, PQ, with a market basket, A, of education and other goods
- Trust fund shifts out the budget line as long as trust fund, PB, is spent on education
- Jane increases satisfaction, moving to higher indifference curve, $U_2$
A Corner Solution - Example

• Jane better off on $U_2$
• B is corner solution
• $MRS \neq \frac{P_E}{P_{OG}}$
A Corner Solution - Example

- If gift is unrestricted, Jane can be at point C on $U_3$
- Better off than with restricted gift
Revealed Preferences

- If we know the choices a consumer has made, we can determine what their preferences are if we have information about a sufficient number of choices that are made when prices and incomes vary.
Revealed Preferences – Two Budget Lines

- $I_1$: Choose A over B
  - A is revealed preferred to B
- $I_2$: Choose B over D
  - B is revealed preferred to D

Diagram:
- Food (units per month) on the x-axis
- Clothing (units per month) on the y-axis
- Two budget lines labeled $I_1$ and $I_2$
- Points A and B indicate choices made based on the revealed preferences.
Revealed Preferences – Two Budget Lines

Food (units per month)

Clothing (units per month)

I₁

I₂

A

B

D

B is preferred to all market baskets in the yellow area

All market baskets in the pink shaded area are preferred to A.
Revealed Preference

- As you continue to change the budget line, individuals can tell you which basket they prefer to others.
- The more the individual reveals, the more you can discern about their preferences.
- Eventually you can map out an indifference curve.
All market baskets in the pink area preferred to A

\[ I_3: \text{E revealed preferred to A} \]

\[ \text{A: preferred to all market baskets in the yellow area} \]

\[ I_4: \text{G revealed preferred to A} \]
Marginal Utility and Consumer Choice

- **Marginal utility** measures the additional satisfaction obtained from consuming one additional unit of a good
  - How much happier is the individual from consuming one more unit of food?
Marginal Utility

- The principle of *diminishing marginal utility* states that as more of a good is consumed, the additional utility the consumer gains will be smaller and smaller.

- Note that total utility will continue to increase since consumer makes choices that make them happier.
Marginal Utility and Consumer Choice

Formally:

\[ 0 = MU_F(\Delta F) + MU_C(\Delta C) \]

No change in total utility along an indifference curve. Trade off of one good to the other leaves the consumer just as well off.
Marginal Utility and Consumer Choice

Rearranging:

\[-\left( \frac{\Delta C}{\Delta F} \right) = \frac{MU_F}{MU_C} \]

Since

\[-\left( \frac{\Delta C}{\Delta F} \right) = MRS \text{ of } F \text{ for } C \]

We can say

\[ MRS = \frac{MU_F}{MU_C} \]
Marginal Utility and Consumer Choice

- When consumers maximize satisfaction:

\[ \text{MRS} = \frac{P_F}{P_C} \]

Since the MRS is also equal to the ratio of the marginal utility of consuming F and C:

\[ \frac{MU_F}{MU_C} = \frac{P_F}{P_C} \]
Marginal Utility and Consumer Choice

Rearranging, gives the equation for utility maximization:

\[
\frac{MU_F}{P_F} = \frac{MU_C}{P_C}
\]