Rational Consumer Behavior: The Marriage of Budget Constraints and Preferences - Consumer Optimization

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I. The Marriage of Budget Constraints and Preferences = Consumer Optimization
   A. Interior Solution
      1. Graphically

Maximize Satisfaction Subject to a Budget Constraint!

Back to our old budget constraint: \( M = 30, P_Y = 3, P_X = 6 \)

Which of the labeled points is most preferred?

Which of the labeled points will you actually choose?
   Pizzas (X) =
   Oreos (Y) =

Maximizing Condition:
B. Corner Solution

1. General Case:

Suppose you really have a VERY strong preference for Oreos relative to Pizzas. What does that say about your MRS?

![Graph showing the MRS between Oreos and Pizzas]

2. Perfect Substitutes

First, use your intuition. Aleve and Tylenol are perfect substitutes in a 4:1 ratio. That is, you only care about killing the pain and are indifferent between taking 4 Tylenol or 1 Aleve. Assume a bottle of Aleve has the same number of pills as a bottle of Tylenol. If Aleve costs $6/bottle and Tylenol costs $4/bottle, how many bottles of each will you buy?

With the following information, show this graphically:

\[
\begin{align*}
M &= $36 \\
P_{\text{Aleve}} &= $6 \\
P_{\text{Tylenol}} &= $4 \\
\end{align*}
\]

![Graph showing the demand for Aleve and Tylenol]

\[
\text{MRS} = \frac{P_{\text{Aleve}}}{P_{\text{Tylenol}}}
\]
Consumer Optimization Problems

Sheila has an income of $90 and currently consumes 15 cups of coffee and 15 tuna fish sandwiches. The price of coffee is $2 a cup and the price of tuna fish sandwiches is $4. At this consumption bundle, Sheila’s MRS for tuna in terms of coffee is 1. Is Sheila in consumer equilibrium? Diagram and indicate how she will move to equilibrium.

Boris budgets $9/week for his morning coffee with milk. He likes it only if it is prepared with 4 parts coffee and one part milk. \( P_C = \$1/oz \) and \( P_M = \$0.50/oz \). How much coffee and milk will Boris buy?

Graphically:

Algebraically:
II. Optimization under a change in income

A. Normal Good:

1. General Case:

   Income INCREASES from $M_L$ to $M_H$

   Is $Y$ normal or inferior?

2. Specific Case

   $P_Y = 1$

   $P_{\text{Jeans}} = $30

   \[
   \begin{array}{|c|c|c|}
   \hline
   & M & Jeans & Y \\
   \hline
   BC0 & 600 & & \\
   BC1 & 1200 & & \\
   BC2 & 900 & & \\
   \hline
   \end{array}
   \]
B. Inferior Good

1. General Case:

Income Increases from M_L to M_H

<table>
<thead>
<tr>
<th>Y</th>
<th>M</th>
<th>Bologna</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC0</td>
<td>700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC1</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC2</td>
<td>500</td>
<td></td>
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</tbody>
</table>

Is Y normal or inferior?

2. Specific Case

P_X = $20/case

P_Y = $1/unit

Can you think of any examples of goods that might be normal then become inferior?
C. Application to consumer optimization under a change in income: Food Stamps (http://www.fns.usda.gov/fsp/)

1. Institutional Details

Goal (http://www.fns.usda.gov/fsp/applicant_recipients/about_fsp.htm):

Eligibility (http://www.fns.usda.gov/fsp/applicant_recipients/eligibility.htm):

<table>
<thead>
<tr>
<th>Financial</th>
<th>Categorical</th>
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</tbody>
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Eligibility (http://www.fns.usda.gov/fsp/applicant_recipients/eligibility.htm):

Benefits (http://www.fns.usda.gov/fsp/applicant_recipients/BEN.HTM)

200__:

<table>
<thead>
<tr>
<th></th>
<th>Family of 1</th>
<th>Family of 2</th>
<th>Family of 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum net income/month for family of 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum benefit for family of 1</td>
<td></td>
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</tbody>
</table>

How are they used? (http://www.fns.usda.gov/fsp/applicant_recipients/using_foodstamps.htm)

# of Food Stamp recipients in 2003:
Average FS amount:
Cost to Federal Government:
2. General Case
Are Food Stamps equivalent to cash?

How much do you spend on food in a month?

Hypothetical Ex: Family of 2
BC0: M (income) = $400, P_{food} = $1, P_Y = $1

Food Stamp Benefit = $100/month
Why do we distribute benefits in-kind?

Efficiency?

Other:
1. 
2. 
3. 

What if there is a black market for food stamps such that recipients get $0.75 per food stamp. How would that change the budget constraint?

Who would sell their food stamps?
3. Whitmore Study

<table>
<thead>
<tr>
<th>Question</th>
<th>Research Method</th>
<th>Finding</th>
</tr>
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<tbody>
<tr>
<td>How many food stamp participants are constrained?</td>
<td></td>
<td></td>
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<tr>
<td>Is there an underground market for food stamps?</td>
<td></td>
<td></td>
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<tr>
<td>What is the nutritional effect of food stamps?</td>
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III. Optimization under a change in price – Consumer Demand
A. Deriving the Individual Demand Curve – Marshallian Demand

Intuition check:
What do you expect to happen to the consumption of clothing when the price fall? Why?

What do you expect to happen to your level of satisfaction if the price of good you consume falls?

Assuming M = $1000 and P_Y = $1, draw the following budget constraints:

<table>
<thead>
<tr>
<th></th>
<th>P_{clothing}</th>
<th>C</th>
<th>P_{clothing}*C</th>
<th>P_Y*Y</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC0</td>
<td>$100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC1</td>
<td>$50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC2</td>
<td>$25</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>BC3</td>
<td>$20</td>
<td></td>
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What is happening to the consumption of clothing as the price falls?

What is happening to your level of satisfaction as the price falls? Why?

What is happening to your income, M, as the price falls?

Draw your demand curve for clothing:

Marshallian Demand
B. Substitution and Income Effect

1. Substitution Effect: Hicksian/Compensated Demand
   - A good becomes more/less expensive, so you substitute away/toward it and toward/away from other goods
   - Shows a change in relative prices without a change in level of satisfaction
   - Tangent to old indifference curve (I₀) (original level of satisfaction) and parallel to new budget constraint (BC₁)

2. Income Effect
   - Change in purchasing power therefore your budget set and level of satisfaction change
   - Parallel movement from BC₀ (substitution effect) to BC₁ and from I₀ to I₁
   - Determines Inferior or normal goods

Example 1:

If \( P_x \) increases to \$2:
- Total Effect (TE) of a price change:
  - Move from BC₀ and I₀ to BC₁ and I₁
  - Substitution Effect (SE):
  - Income Effect (IE):

Are goods X and Y normal or inferior?

Marshallian Demand:
- A to C

Hicksian Demand:
- \( \frac{S}{X} = P \)
Example 2:

$BC_0$

$M=20$

$P_w=1$

$P_Y=2$

*If $P_w$ increases to $2$:

Total Effect (TE) of a price change:
- A to C
- Move from $BC_0$ and $I_0$ to $BC_1$ and $I_1$

Substitution Effect (SE):

Income Effect (IE):

Are goods X and Y normal or inferior?
3. **Specific Marshallian Demand Curves** - Perfect Complements

\[
U = \min(X,Y) \\
M = P_X X + P_Y Y
\]

What does the substitution effect look like for perfect complements?
D. Application: Children

Income has increased over time and the number of children/couple has decreased. Therefore children are inferior goods. Agree or disagree, using indifference curves and budget constraints.