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 $P_F F$ 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:

\[ P_F F + P_C C = I \]

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

### Income

\[ I = P_F F + P_C C \]

<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 pp. 79 - 83

\[ \text{Slope} = \frac{\Delta C}{\Delta F} = \frac{1}{2} = \frac{P_F}{P_C} \]

\[ 1F + 2C = 80 \]

\[ (I/PC) = 40 \]
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 Budget Line pp. 79 - 83

- The slope indicates the rate at which the two goods can be substituted without changing the amount of money spent.
- We can rearrange the budget line equation to make this more clear.
The Budget Line

\[ I = P_X X + P_Y Y \]
\[ I - P_X X = P_Y Y \]
\[ \frac{I}{P_Y} - \frac{P_X}{P_Y} X = Y \]
The Budget Line pp. 79 - 83

- $1F + 2C = 80$
- $C = -0.5F + 40$
The Budget Line

- The vertical intercept, \( \frac{I}{P_C} \), illustrates the maximum amount of C that can be purchased with income I.
- The horizontal intercept, \( \frac{I}{P_F} \), illustrates the maximum amount of F that can be purchased with income I.
The Budget Line pp. 79 - 83

- 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

The Effects of Changes in Income
- An increase in income causes the budget line to shift outward, parallel to the original line (holding prices constant).
- Can buy more of both goods with more income
- How about when an income tax is raised?
The Budget Line - Changes

An increase in income shifts the budget line outward.

A decrease in income shifts the budget line inward.
The Effects of Changes in Prices

- If the price of one good increases, the budget line shifts inward, pivoting from the other good’s intercept.
- If the price of food increases and you buy only food (x-intercept), then you can’t buy as much food. The x-intercept shifts in.
- If you buy only clothing (y-intercept), you can buy the same amount. No change in y-intercept.
The Budget Line - Changes

The Effects of Changes in Prices

- If the price of one good decreases, the budget line shifts outward, pivoting from the other good’s intercept.
- If the price of food decreases and you buy only food (x-intercept), then you can buy more food. The x-intercept shifts out.
- If you buy only clothing (y-intercept), you can buy the same amount. No change in y-intercept.
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.
The Effects of Changes in Prices

- If the two goods increase in price, but the ratio of the two prices is unchanged, the slope will not change.
- However, the budget line will shift **inward** parallel to the original budget line.
- Example: An increase in sales (Consumption) tax.
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 pp. 83 - 89

- 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.
The maximizing market basket must satisfy two conditions:

1. It must be located on the budget line
   - They spend all their income – more is better
2. It must give the consumer the most preferred combination of goods and services
Graphically, we can see different indifference curves of a consumer choosing between clothing and food.

Remember that $U_3 > U_2 > U_1$ for our indifference curves.

Consumer wants to choose highest utility within their budget.
A, B, C on budget line
D highest utility but not affordable
C highest affordable utility
Consumer chooses C
Consumer Choice  pp. 83 - 89

- 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:

\[ Slope = - \frac{P_F}{P_C} \]
Therefore, it can be said at consumer’s optimal consumption point,

\[ MRS = \frac{P_F}{P_C} \]
It can be said that satisfaction is maximized when \textit{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
Optimal consumption point is where marginal benefits equal marginal costs.

MB = MRS = benefit associated with consumption of 1 more unit of food. Or, it shows how much you are willing to pay in units of clothing for an additional unit of food (i.e., your subjective evaluation).

MC = cost of additional unit of food

\[ P_F / P_C \] (units of clothing you must give up in exchange for an additional unit of food)
If MRS $\neq P_F/P_C$ then individuals can reallocate basket to increase utility

If MRS $> P_F/P_C$
- Will increase food and decrease clothing until MRS $= P_F/P_C$

If MRS $< P_F/P_C$
- Will increase clothing and decrease food until MRS $= P_F/P_C$
Point $B$ does not maximize satisfaction because the MRS = $-10/10 = 1$ is greater than the price ratio = $1/2$.
Consider two groups of consumers, each wishing to spend $10,000 on the styling and performance of a car.

Each group has different preferences.
By finding the point of tangency between a group’s indifference curve and the budget constraint, auto companies can see how much consumers value each attribute.
These consumers want performance worth $7000 and styling worth $3000.
These consumers want styling worth $7000 and performance worth $3000.
Once a company knows preferences, it can design a production and marketing plan.

Company can then make a sensible strategic business decision on how to allocate performance and styling on new cars.
A *corner solution* exists if a consumer buys in extremes, and buys all of one category of good and none of another.

- MRS is **not** necessarily equal to $P_A/P_B$.
A corner solution exists at point B.
A Corner Solution pp. 83 - 89

- At point B, the MRS of ice cream for frozen yogurt is greater than the slope of the budget line.
- If the consumer could give up more frozen yogurt for ice cream, he would do so.
- However, there is no more frozen yogurt to give up.
- Opposite is true if corner solution was at point A.
A Corner Solution pp. 83 - 89

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

- In this instance it can be said that:

\[ MRS \geq \frac{P_{\text{Ice Cream}}}{P_{\text{Frozen Yogurt}}} \]
If the MRS is, in fact, significantly greater than the price ratio, then a small decrease in the price of frozen yogurt will not alter the consumer’s market basket.