

Microeconomics

The Theory of Consumer Choice

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3. The Budget Constraint
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1. Consumer Preference

Consumers spend their money on the products that give them the most pleasure. All consumers must choose which goods to buy because limits on wealth prevent them from buying everything that catches their fancy.

To explain consumer behavior, economists *assume* that consumers have a set of tastes or preferences that they use to guide them in choosing between goods. These tastes differ substantially across individuals.

Economists make *three assumptions* about the preferences of the typical consumer:

1. Completeness. Consumer is indifferent between two options when both are equally satisfactory. This preference ranking reflects the relative desirability of the options themselves and ignores their cost.

$$X > Y, Y > X, X \sim Y$$

2. Transitivity. A consumer can rank (in order of preference) all market baskets. A consumer prefers market baskets X to Y, Y to Z, then the consumer weakly prefer baskets X to Z.

$$\left. \begin{array}{l} \text{If } X > Y \\ \text{and } Y > Z \end{array} \right\} \rightarrow \text{then } X > Z$$

3. More is better. Consumer prefers more of any goods to less.

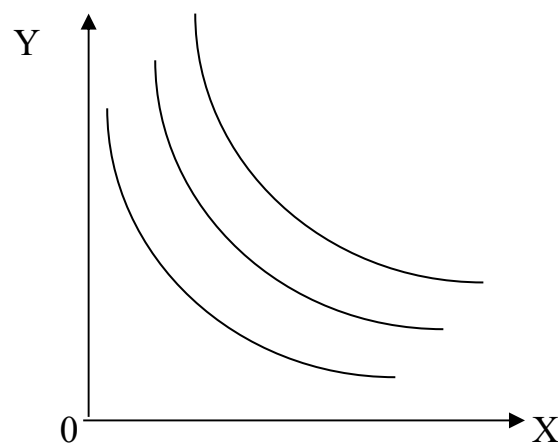
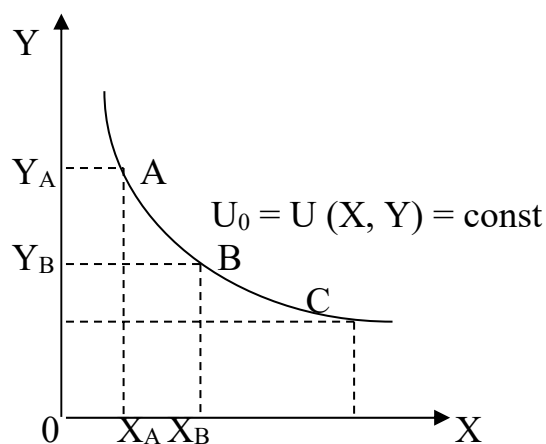
Economic “goods” are commodities of which more is better than less.

$$X(\Delta_i) = (X_1, \dots, X_i, X_i + \Delta_i, X_{i+1}, \dots, X_n), \Delta_i > 0$$

Economic “bads” are commodities of which less is preferred to more over all possible ranges of consumption.

$$X > X(\Delta_i) = (X_1, \dots, X_i, X_i + \Delta_i, X_{i+1}, \dots, X_n)$$

We can show a consumer's preferences across various market baskets (combinations of goods) in a diagram with indifference curves. **Indifference curve** plots all the market baskets that the consumer views as being equally satisfactory.



To show a consumer's entire preference ranking, we need a set of indifference curves or ***Indifference map***.

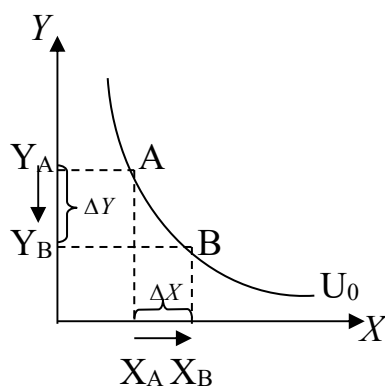
All indifference curve maps must have four important properties:

1. Bundles on indifference curves farther from the origin are preferred to those on indifference curves closer to the origin: Because more is preferred to less, the consumer prefers higher indifference curves.
2. There is an indifference curves thorough every possible bundle as a consequence of the completeness property: the consumer can compare any bundle to another. Connecting the bundles that give the same pleasure produces an indifference curve that includes the given bundle.
3. Indifference curves cannot cross: a given bundle cannot be on two indifference curves.
4. Indifference curves slope down: to stay on the same level of satisfaction consumer that consumes more of one good have to consume less of the other.

The slope of indifference curve is equal to the ***Marginal Rate of Substitution*** of X to Y – it is the number of units of Y for which consumer is just wiling to trade one unit of X. MRS can be thought of as the value that the consumer places on his last unit of X, measured in terms of Y.

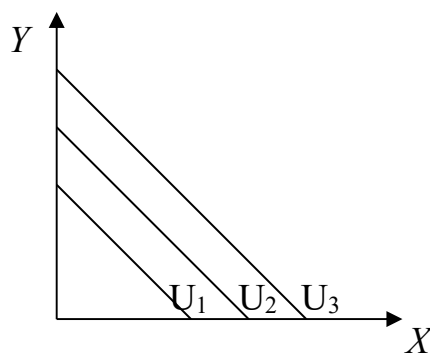
$$MRS_{X,Y} = \Delta Y / \Delta X$$

$$MRS_{X,Y} < 0.$$

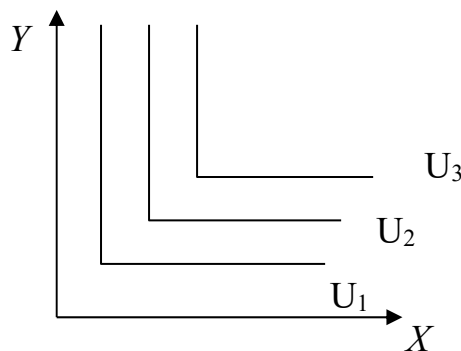


As the consumer moves along an indifference curve in the direction of more X and less Y, we expect that his MRS will decrease. So, a Diminishing MRS means that as more and more of one good is consumed along an indifference curve, the consumer is willing to give up less and less of some other good to obtain still more of the first good. That is why the slope of each indifference curve becomes flatter as we move down that curve. Remind that the indifference curve's slope measures the consumer's marginal rate of substitution.

The shapes of indifference curves in general indicate the willingness of consumer to substitute one good for another and remain equally well off. At one extreme, certain goods are *perfect substitute* in consumption. For example, butter and margarine. Indifference curves are straight line when goods are perfect substitutes in consumption.



At the other extreme are goods that are perfect complements in consumption. Perfect complements are goods that must be consumed in a precise combination in order to provide a consumer a given level of satisfaction. With perfect complements, indifference curves are L-shaped.



2. Utility

Underlining our model of consumer behavior is the belief that consumer can compare various bundles of goods and decide which gives them the greatest pleasure. We can summarize a consumer's preferences by assigning a numerical value to each possible bundle reflecting the consumer's relative ranking of these bundles.

Economists call the numerical value that reflects the relative ranking of various bundles of goods **utility**.

Utility function is the relationship between this utility measure and every possible bundle of goods

$$U = f(X, Y)$$

If a consumer has the utility function $U = f(X, Y)$, then his indifference curves are the curves with equation $U = f(X, Y) = C$, where C is constant.

Utility function reflects **Total Utility**. Assuming that it is measurable, it is the total satisfaction a consumer receives from a given level of consumption

Marginal Utility is the amount by which total utility rises when consumption increases by one unit

$$MU_X = \frac{U(X + \Delta) - U(X)}{\Delta}$$

$$MU_X = \frac{\delta f(X, Y)}{\Delta X} \qquad MU_Y = \frac{\delta f(X, Y)}{\Delta Y}$$

The assumption of **Diminishing Marginal Utility** holds that as more of a given good is consumed, the marginal utility associated with the consumption of additional units tends to decline, other things being equal.

We can relate the concept of marginal utility to the concept of the marginal rate of substitution:

- Suppose that we reduce your consumption of X by ΔX units. This reduces your utility by the amount $MU_X \cdot \Delta X$
- Suppose that we increase your consumption of Y by ΔY units. This increases your utility by the amount $MU_Y \cdot \Delta Y$
- Suppose to leave you just as happy as you were before the changes in your consumption

Regarding terms, we get

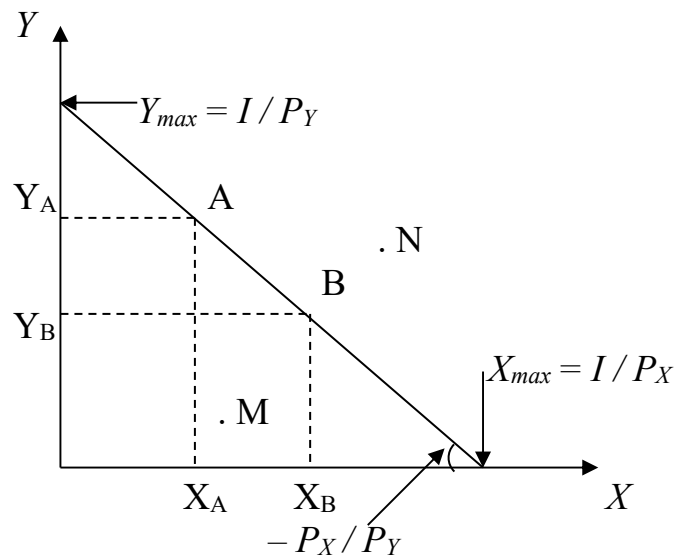
$$\left. \begin{array}{l} \Delta Y \cdot MU_Y = \Delta X \cdot MU_X \\ \frac{\Delta Y}{\Delta X} = \frac{MU_X}{MU_Y} \end{array} \right\} MRS_{X,Y} = MU_X / MU_Y$$

3. The Budget Constraint

Budget Constraint is the way in which a consumer's income and the prices that must be paid for various goods limit choices.

$$P_X \cdot X + P_Y \cdot Y = I$$

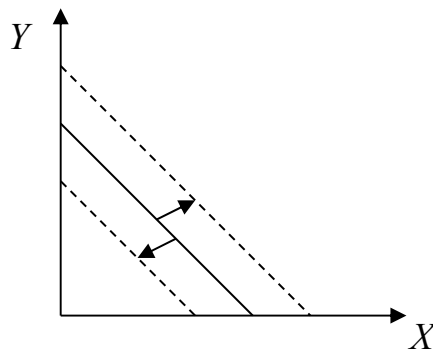
The line described by this equation is a picture of all the baskets that the consumer can afford with a given income and prices of goods. It is called the consumer's **budget line**.



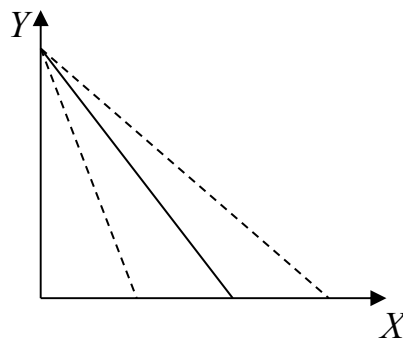
Any basket inside the line, such as *M*, involves a total outlay that is smaller than the consumer income. Any point outside the line, such as *N*, requires an outlay larger than the consumer's income and is therefore beyond reach.

The consumer's income and the market process of the goods determine the position and slope of the budget line:

Effect of an Income Change on the Budget Line is a change in income when product prices remain unchanged results in a parallel shift in the budget line



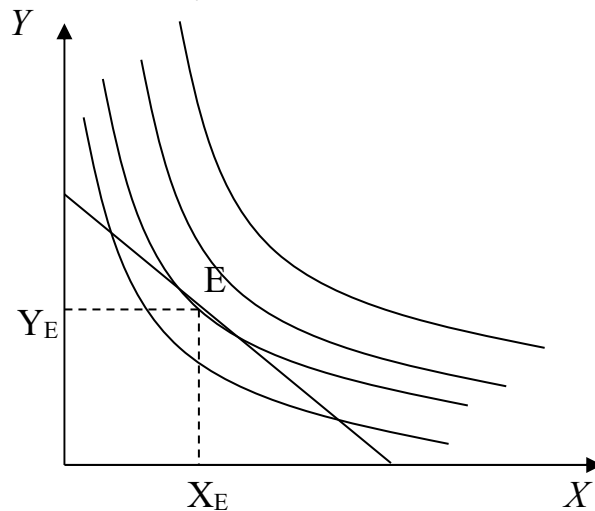
Effect of a Price Change on the Budget Line is a change in the price of one good, with income and the other good's price remaining unchanged, causes the budget line to rotate about one of the intercepts



4. The Consumer's Choice

To determine which of the points on the budget constraint gives consumer the highest level of pleasure, we use his indifference curves.

- Indifference curves represent the consumer's preferences toward various market baskets;
- The budget line shows what market baskets the consumer can afford;
- Putting these pieces together, we can determine what market basket the consumer will actually choose.



The optimal bundle must lie on the budget constraint and be on an indifference curve that does not cross it. Such a bundle is the consumer's equilibrium.

Bundles that lie on indifference curves above the constraint are not in the opportunity set.

Any bundle inside the constraint would fail to exhaust income and are less desirable.

The market basket the consumer will choose is shown by point *E*, where the budget line is tangent (has the same slope as) an indifference curve.

The slope of an indifference curve is related to the marginal utilities of the two goods:

$$MU_X / MU_Y = \Delta Y / \Delta X$$

A budget line's slope is equal to the ratio of prices:

$$P_X / P_Y = \Delta Y / \Delta X$$

At the consumer optimum:

$$MRS_{X,Y} = P_X / P_Y = MU_X / MU_Y$$

To solve a maximization problem is necessary to use the system of equations:

$$\begin{cases} \Delta Y / \Delta X = P_X / P_Y \quad \text{or} = MU_X / MU_Y \\ P_X \cdot X + P_Y \cdot Y = I \end{cases}$$