

Subject: Microeconomic Theory I

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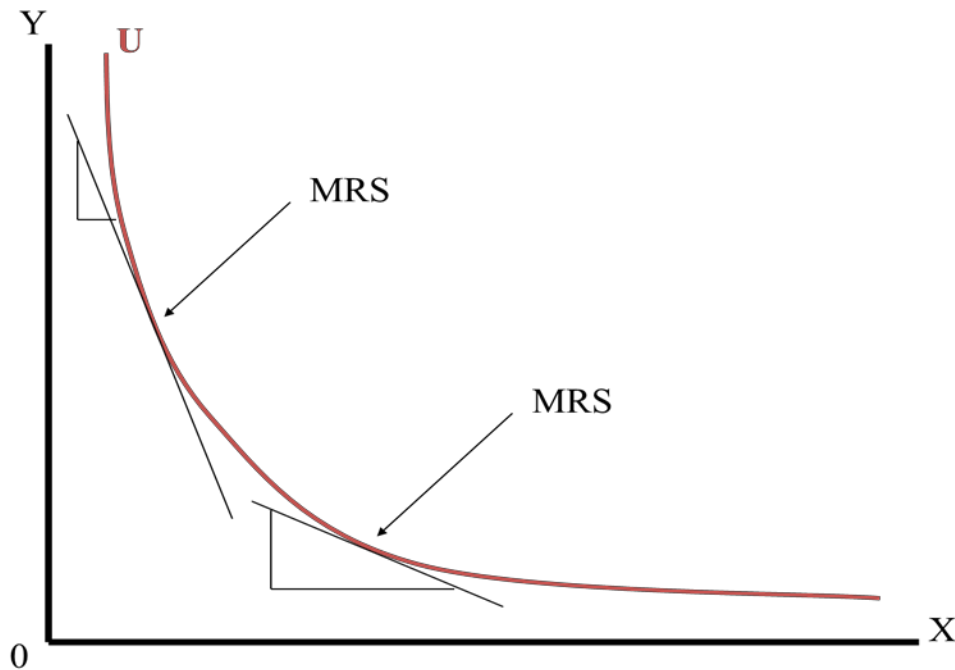
Assumptions of Indifference Curve:

- Existence of two products X and Y in a commodity space where both the products are normal and the consumption combinations are positive definite.
- The utility function is dependent which can be written as $U = f(x, y)$ and I.C considers related product where both the products are substitute to each other.
- The level of satisfaction is ordinarily measurable which means ranking of different combinations is possible according to the preference of the consumer.
- The relationship may be indifferent, i.e. if the combinations on A & B or B & C are equally preferable then the combination of A & C must be equally preferable to the consumer.
- The relation may be transitive.
- Application of the diminishing marginal rate of substitution.
- (The marginal rate of substitution of X for Y ($MRS_{x,y}$) is defined as the no of units of good Y that must be given up in exchange for an extra unit of good X, so that the consumer maintains the same level of satisfaction.)

Marginal Rate of Substitution

Marginal Rate of Substitution is the rate at which a consumer is willing to substitute one good for another good while remaining at the same level of satisfaction. That is the amount of good X needed to replace one unit of (lost) good Y to keep the consumer's level of satisfaction (utility) unchanged.

MRS = Slope of the indifference curve



Properties of an Indifference Curve or IC

Here are the properties of an indifference curve:

An IC slopes downwards to the right

This slope signifies that when the quantity of one commodity in combination is increased, the amount of the other commodity reduces. This is essential for the level of satisfaction to remain the same on an indifference curve.

An IC is always convex to the origin

From our discussion above, we understand that as Peter substitutes clothing for food, he is willing to part with less and less of clothing. This is the diminishing marginal rate of substitution. The rate gives a convex shape to the indifference curve. However, there are two extreme scenarios:

1. Two commodities are perfect substitutes for each other – In this case, the indifference curve is a straight line, where MRS is constant.
2. Two goods are perfect complementary goods – An example of such goods would be gasoline and water in a car. In such cases, the IC will be L-shaped and convex to the origin.

Indifference curves never intersect each other

Two ICs will never intersect each other. Also, they need not be parallel to each other either. Look at the following diagram:

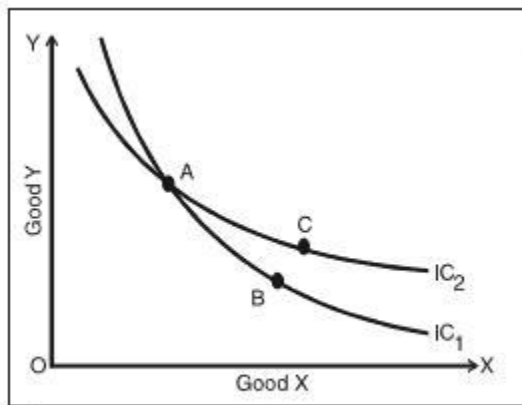


Fig. 3 : Intersecting Indifference Curves

Fig 3 shows two ICs intersecting each other at point A. Since A and B lie on IC₁, they give the same satisfaction level. Similarly, A and C give the same satisfaction level, as they lie on IC₂. Therefore, we can imply that B and C offer the same level of satisfaction, which is logically absurd. Hence, no two ICs can touch or intersect each other.

A higher IC indicates a higher level of satisfaction as compared to a lower IC

A higher IC means that a consumer prefers more goods than not.

An IC does not touch the axis

This is not possible because of our assumption that a consumer considers different combinations of two commodities and wants both of them. If the curve touches either of the axes, then it means that he is satisfied with only one commodity and does not want the other, which is contrary to our assumption.

Budget Line

Since a higher indifference curve represents a higher level of satisfaction, a consumer will try to reach the highest possible IC to maximize his satisfaction. In order to do so, he has to buy more goods and has to work under the following two constraints:

1. He has to pay the price for the goods and
2. His income is limited, restricting the availability of money for purchasing these goods

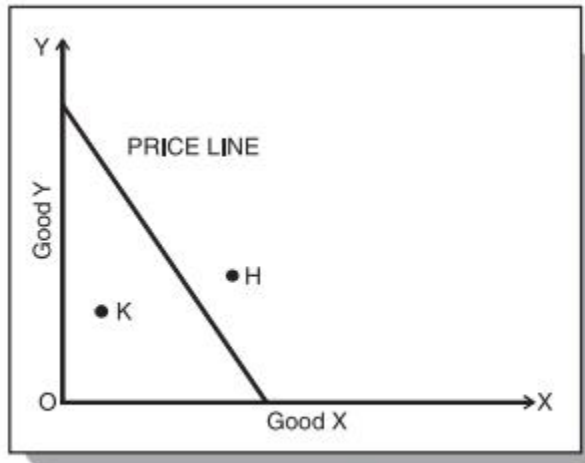


Fig. 4 : Price Line

As can be seen above, a budget line shows all possible combinations of two goods that a consumer can buy within the funds available to him at the given prices of the goods. All combinations that are within his reach lie on the budget line.

A point outside the line (point H) represents a combination beyond the financial reach of the consumer. On the other hand, a point inside the line (point K) represents under-spending by the consumer.

Changes in Price and Shift in Budget Line:

Now, what happens to the price line if either the prices of goods change or the income changes. Let us first take the case of the changes in prices of the goods. This is illustrated in Fig. 8.16. Suppose the budget line in the beginning is BL, given certain prices of the goods X and Y and a certain income. Suppose the price of X falls, the price of Y and income remaining unchanged.

Now, with a lower price of X the consumer will be able to purchase more quantity of X than before with his given income. Let at the lower price of X, the given income purchases OL' of X which is greater than OL. Since the price of Y remains the same, there can be no change in the quantity purchased of good Y with the same given income and as a result there will be no shift in the point B. Thus, with the fall in the price of good X, the consumer's money income and the price of Y remaining constant, the price line will take the new position BL'.

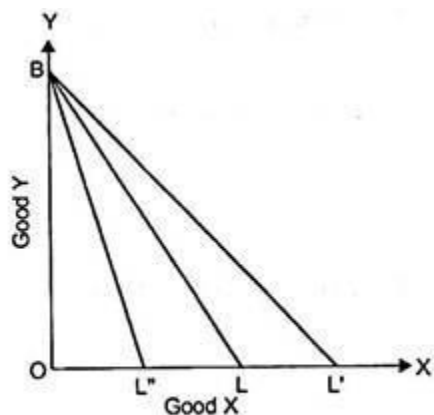


Fig. 8.16. Changes in Budget Line as a Result of Changes in Price Good X

Now, what will happen to the budget line (initial budget line BL) if the price of good X rises, the price of good Y and income remaining unaltered. With higher price of good X, the consumer can purchase smaller quantity of X, say OL'', than before. Thus, with the rise in price of X the price line will assume the new position BL''.

Fig. 8.17 shows the changes in the price line when the price of good Y falls or rises, with the price of X and income remaining the same. In this the initial budget line is BL.

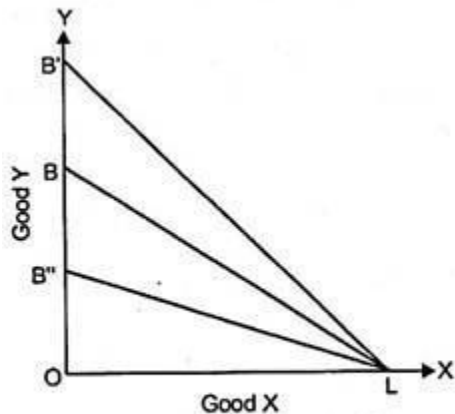


Fig. 8.17. Changes in Price Line as a Result of Changes in price of Good Y

With the fall in price of good Y, other things remaining unchanged, the consumer could buy more of Y with the given money income and therefore budget line will shift to LB'. Similarly, with the rise in price Y, other things being constant, the budget line will shift to LB''.

Changes in Income and Shifts in Budget line:

Now, the question is what happens to the budget Y line if the income changes, while the prices of goods remain the same. The effect of changes in income on the budget line is shown in Fig.

8.18. Let BL be the initial budget line, given certain prices of goods and income.' If the consumer's income increases while the prices of both goods X and Y remain unaltered, the price line shifts upward (say, to B'L') and is parallel to the original budget line BL.

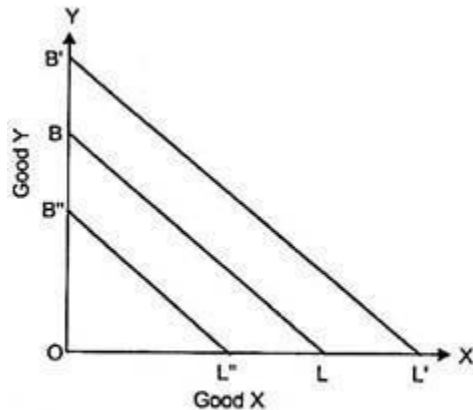


Fig. 8.18. Shifts in Budget Line as a Result of Changes in Income

This is because with the increased income the consumer is able to purchase proportionately larger quantity of good X than before if whole of the income is spent on X, and proportionately greater quantity of good Y than before if whole of the income is spent on Y. On the other hand, if the income of the consumer decreases, the prices of both goods X and

Y remaining unchanged, the budget line shifts downward (say, to B''L'') but remains parallel to the original price line BL. This is because a lower income will purchase a proportionately smaller quantity of good X if whole of the income is spent Changes in Income on X and proportionately smaller quantity of good Y if whole of the income is spent on Y.

It is clear from above that the budget line will change if either the prices of goods change or the income of the consumer changes.

Thus, the two determinants of the budget line are:

- (a) The prices of goods, and
- (b) The consumer's income to be spent on the goods.

Slope of the Budget Line and Prices of two Goods:

It is also important to remember that the slope of the budget line is equal to the ratio of the prices of two goods. This can be proved with the aid of Fig. 8.14. Suppose the given income of the consumer is M and the given prices of goods X and Y are P_x and P_y respectively. The slope of

the budget line BL is OB/OL. We intend to prove that slope OB/OL is equal to the ratio of the price of goods X and Y.

The quantity of good X purchased if whole of the given income M is spent on it is OL.

Therefore,
$$OL \times P_x = M$$

$$OL = \frac{M}{P_x} \quad \dots(i)$$

Now, the quantity of good Y purchased if whole of the given income M is spent on it is OB.

Therefore,
$$OB \times P_y = M$$

$$OB = \frac{M}{P_y} \quad \dots(ii)$$

Dividing (ii) by (i) we have,

$$\frac{OB}{OL} = \frac{\frac{M}{P_y}}{\frac{M}{P_x}} = \frac{M}{P_y} \times \frac{P_x}{M} = \frac{P_x}{P_y}$$

Thus, slope of budget line = $\frac{OB}{OL} = \frac{P_x}{P_y}$

It is thus proved that the slope of the budget line BL represents the ratio of the prices of two goods.

Consumer Equilibrium

Conditions of Consumer's Equilibrium:

The consumer's equilibrium under the indifference curve theory must meet the following two conditions:

(i) $MRS_{XY} = \text{Ratio of prices or } P_X/P_Y$

Let the two goods be X and Y. The first condition for consumer's equilibrium is that

$$MRS_{XY} = P_X/P_Y$$

a. If $MRS_{XY} > P_X/P_Y$, it means that the consumer is willing to pay more for X than the price prevailing in the market. As a result, the consumer buys more of X. As a result, MRS falls till it becomes equal to the ratio of prices and the equilibrium is established.

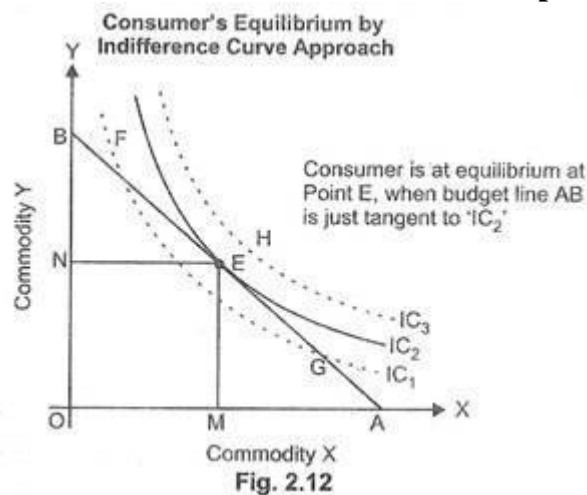
b. If $MRS_{XY} < P_X/P_Y$, it means that the consumer is willing to pay less for X than the price prevailing in the market. It induces the consumer to buy less of X and more of Y. As a result, MRS rises till it becomes equal to the ratio of prices and the equilibrium is established.

(ii) MRS continuously falls:

The second condition for consumer's equilibrium is that MRS must be diminishing at the point of equilibrium, i.e. the indifference curve must be convex to the origin at the point of equilibrium. Unless MRS continuously falls, the equilibrium cannot be established.

Thus, both the conditions need to be fulfilled for a consumer to be in equilibrium.

Let us now understand this with the help of a diagram:



In Fig. 2.12, IC_1 , IC_2 and IC_3 are the three indifference curves and AB is the budget line. With the constraint of budget line, the highest indifference curve, which a consumer can reach, is IC_2 . The budget line is tangent to indifference curve IC_2 at point 'E'. This is the point of consumer equilibrium, where the consumer purchases OM quantity of commodity 'X' and ON quantity of commodity 'Y'.

All other points on the budget line to the left or right of point 'E' will lie on lower indifference curves and thus indicate a lower level of satisfaction. As budget line can be tangent to one and

only one indifference curve, consumer maximizes his satisfaction at point E, when both the conditions of consumer's equilibrium are satisfied:

(i) MRS = Ratio of prices or P_X/P_Y :

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At tangency point E, the absolute value of the slope of the indifference curve (MRS between X and Y) and that of the budget line (price ratio) are same. Equilibrium cannot be established at any other point as $MRS_{XY} > P_X/P_Y$ at all points to the left of point E and $MRS_{XY} < P_X/P_Y$ at all points to the right of point E. So, equilibrium is established at point E, when $MRS_{XY} = P_X/P_Y$.

(ii) MRS continuously falls:

The second condition is also satisfied at point E as MRS is diminishing at point E, i.e. IC_2 is convex to the origin at point E.

Books

1. Pindyck and Rubinfeld with Mehta (2005), Microeconomics- latest available Edition in market.
2. D.N Dwivedi (2016), Microeconomics Theory and Application-- latest available Edition in market.
3. Koutsoyiannis, A., Modern Microeconomics, Macmillan, London.