6.4. Three Demand Curves

We have derived the demand curve from the price consumption curve. The demand curve derived from the price effect is known as the Marshallian demand curve (or, the ordinary demand curve). Two other demand curves can also be deduced from the indifference map of the consumer on the basis of substitution effects of Hicks and Slutsky. Suppose that each time when price changes the consumer is compensated by a change in money income so as to keep his utility level constant. There is then a Hicksian substitution effect. The corresponding price quantity combinations give us the Hicksian demand curve. Similarly the demand curve derived from the Slutsky measure of substitution effect is called the Slutsky demand curve. The three demand curves are shown in the side figure (fig. 6.8).

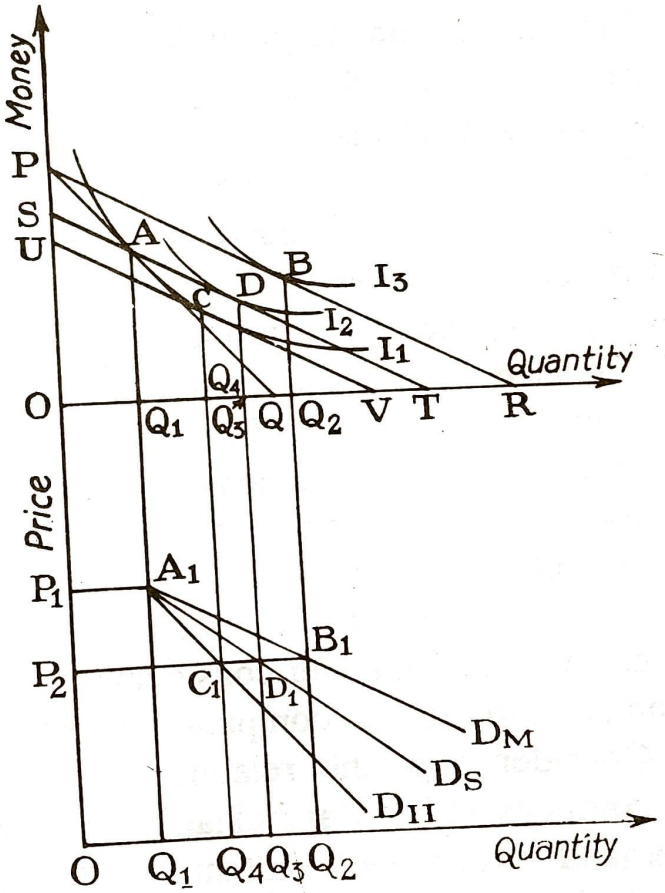

Fig. 6.8

In the figure PQ is the initial price line and A is the initial equilibrium point. At point A the price is OP_1 and the quantity demanded is OQ_1. The point A_1 of the lower part of the diagram corresponds to the point A of the upper part of the diagram. Now suppose that the price falls to OP_2 and the new price is represented by the slope of the price line PR. The new equilibrium point is B where the quantity demanded is OQ_2. The movement from A to B is the result of the price effect. The point B_1 in the lower part corresponds to the point B of the upper part. B_1 is a point on the Marshallian demand curve since it is the result of price effect which is the resultant of both the income effect and the substitution effect.

But suppose now that the price falls to OP_2 but at the same time the money income of the consumer also falls in such a way that he

remains on the initial indifference curve I_1. This happens when the budget line PR shifts parallely to the left to its new position UV which is tangent to the initial indifference curve I_1. The consumer is then in equilibrium at C where the quantity demanded is Q_4. The point C_1 on the lower part is derived from the point C of the upper part. The movement from A to C is the Hicks measure of the substitution effect and C_1 is a point on the Hicksian demand curve.

Again suppose that when price falls to OP_2 the money income of the consumer is also reduced in such a manner that the new budget line ST passes through the initial equilibrium point A. The consumer is now in equilibrium at D where quantity demanded is OQ_3. The point D_1 in the lower part where the quantity demanded is OQ_3 at price OP_2 corresponds to point D of the upper part. Since the movement from A to D is the Slutsky measure of the substitution effect, D_1 is a point on the Slutsky demand curve. In the lower part we have plotted all the three demand curves. D_M is the Marshallian demand curve or, the ordinary demand curve, D_s is the Slutsky demand curve and D_H is the Hicksian demand curve. The demand curve D_M is derived from the price effect. As we move down D_M the real income is not constant. Both income and substitution effects are in operation. But on the demand curves D_H or, D_S the real income is assumed to be constant according to the definitions of Hicks or Slutsky. In both the demand curves the income effect is absent and both of them are products of substitution effects.

If the price change is very small the Hicks measure and the Slutsky measure will not differ considerably and we can lump them together and refer to them as compensated demand curves.

Consider now the relation between the compensated and the uncompensated (Marshallian) demand curves. The Marshallian demand curve is the resultant of both income and substitution effects while the compensated demand curve is the resultant of only substitution effect. Since for a normal commodity both the income effect and the substituion effect will tend to increase the quantity demanded as price falls, the quantity demanded on the Marshallian demand curve will be greater than the quantity demanded on the compensated demand curve. This means that the ordinary demand curve will lie to the right of the compensated demand curve for a normal commodity. By the same reasoning the ordinary demand curve will lie to the left of the

compensated demand curve for an inferior commodity. Again since the substitution effect is such that as price falls the quantity demanded increases, the compensated demand curve is always downward sloping. It can never be upward rising. But the ordinary demand curve may be upward rising if the commodity in question is a Giffen commodity for which the income effect is negative and stronger than the substitution effect. The law of demand is therefore always true for the compensated demand curve but it is not so for the ordinary demand curve.

Mathematically, the Hicksian compensated demand curve is obtained from the first order conditions of minimising the budget equation subject to the condition that utility is fixed at a certain level. Our problem is to minimise $p_1q_1 + p_2q_2$ subject to $U^0 = f(q_1, q_2)$. To solve this problem let us form the Lagrange expression $z = p_1q_1 + p_2q_2 + \mu[U^0 - f(q_1, q_2)]$ where μ is the Lagrange multiplier. The first order conditions of minimisation require

$$\frac{\delta z}{\delta q_1} = p_1 - \mu f_1 = 0$$

$$\frac{\delta z}{\delta q_2} = p_2 - \mu f_2 = 0$$

$$\frac{\delta z}{\delta \mu} = U^0 - f(q_1, q_2) = 0$$

In these 3 equations the unknowns are q_1, q_2 and μ while the parameters are p_1 and p_2. Solving for q_1 and q_2 we can get the compensated demand functions for q_1 and q_2 respectively. That is, $q_1^* = \phi_1(p_1, p_2)$ and $q_2^* = \phi_2(p_1, p_2)$. These functions are homogeneous of degree zero in prices. Thus while the ordinary demand functions are functions of p_1, p_2 and y, the compensated demand functions are functions of p_1 and p_2 only.

6.5. The Elasticity of Demand

From the indiffference curve analysis we know that if the consumer is purchasing two commodities whose prices are given and if the income of the consumer is also given, then the demand functions of the consumer for the two commodities can be determined from the principle of utility maximisation. The demand for each commodity will be a function of all prices and the level of income. If q_1 and q_2 are the amounts of the two commodities, if p_1 and p_2 are their respective