Marshall's Cash Balance Equation

From the above statement, it is clear that the total demand for money is a function of the annual income and the size of assets and the demand function for money, according to Marshall, can be expressed as

$$M = KY + K'A$$

where M is the total supply of money which consists of currency and demand deposits with the banks ; Y is the money income ; K is that proportion of money income (Y) which the people intend to hold in the form of cash ; A is the money value of the assets or wealth ; and K′ is proportion of the total assets which people intend to hold in form of cash.

The above Marshallian equation came to be modified at the hands of the successors of Marshall, when they dropped the assets part of the equation and re-stated the money demand function as

$$M = KY \qquad ...(i)$$

The money income of the community is equal to the value of the total output *i.e.*,

$$Y = P.O \qquad ...(ii)$$

Substituting for Y in equation (*i*), the Marshallian equation can be stated as

$$M = KPO$$

or

$$P = \frac{M}{KO} \qquad ...(iii)$$

If K = 0.10, O = 10000 units and M = Rs.8000, then average price of a unit of output is

$$P = \frac{M}{KO} = \frac{8000}{0{\cdot}10 \times 10000}$$

$$= \frac{8000}{1000} = \text{Rs.}8$$

The Marshallian approach emphasises that the shift in the magnitude of K may significantly influence the price level even though the supply of money remains constant. Suppose K rises from 0.10 to 0.15, price per unit of output will decline as

$$P = \frac{M}{KO} = \frac{8000}{0{\cdot}15 \times 10000} = \frac{8000}{1500}$$

$$= \frac{16}{3} = \text{Rs. } 5.33$$

If K falls from 0.10 to 0.08 then P will rise as

$$P = \frac{M}{KO} = \frac{8000}{0{\cdot}08 \times 10000} = \frac{8000}{800} = \text{Rs. } 10$$

Thus, it is K and not M which is of profound significance in this equation.

Pigou's Cash Balance Equation

The Marshallian cash balances approach was further developed by A.C. Pigou and it was expressed as

$$P = \frac{KR}{M} \qquad ...(iv)$$

P here does not stand for the price level but has an exactly opposite meaning. It represents the purchasing power of the value of money. P, in Pigou's equation, is the reciprocal of P in Fisher's equation. R represents total real income. K stands for the proportion of real income that the people hold in the form of cash and M represents the number of units of legal tender (or total quantity of money or cash).

The total stock of money, however, is not held strictly in the form of legal tender. A part of money is held in the form of cash and the remaining part is held in the form of bank deposits. In its enlarged form, Pigou restated the Cambridge equation as

$$P = \frac{KR}{M}[c + h(1-c)] \qquad ...(v)$$

where c is the proportion of cash which is held by the people in the form of legal tenders so that $(1-c)$ is the proportion of cash held in the form of bank deposits and h is the proportion of legal tenders to deposits held by the banks.

If in the above equation K,R, c and h are taken as constant, Pigou's equation gives a rectangular hyperbola or a *uniform unitary elastic demand function for money* so that the halving of the purchasing power of money leads to the doubling of the demand for money and vice-versa. A product of P and M remains throughout constant. The uniform unitary elastic demand function for money has been shown through Fig. 1.

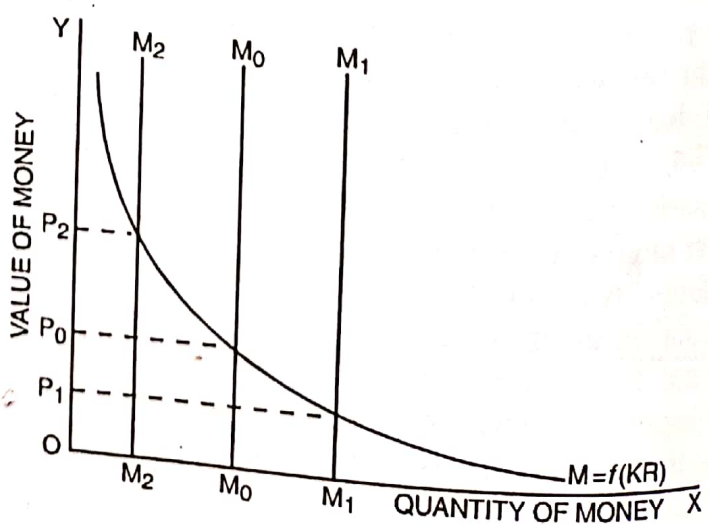

Fig. 1

M in Fig. 1 is the demand function for money which is a function of KR. It slopes negatively because a unit of money must be worth less in terms of goods and services, if the people are induced to hold more money. The curve, being a rectangular hyperbola, tends to approach the two axes but actually never touches either of them. Given this shape of money demand function, any change in the quantity of money brings about inversely proportionate changes in the value of money. Assuming that the supply of money is determined autonomously by the monetary authority in a country, M_0M_0, M_1M_1 and M_2M_2 are the vertical money supply curves. When quantity of money is increased from M_0 to M_1, the value of money falls from P_0 to P_1 and as the quantity of money is reduced from M_0 to M_2, the value of money rises from P_0 to P_2. The changes in the quantity of money and the value of money are in exact inverse proportion to each other.

Pigou's equation explains the reason why money has any value at all and why do people decide to hold larger or smaller proportions of their income in the form of money. During a period of rising prices, since the value of money declines, people want to hold a smaller proportion of their income in the form of cash. During the period of depression, since the value of money increases under such circumstances the magnitude of K registers an increase.

But Keynes was not satisfied with Pigou's equation. R in Pigou's equation is, no doubt, of great significance, yet Keynes believed that this significance was greatly diminished when the total deposits (demand deposits + saving or time deposits) and not merely the income deposits (demand deposits) were taken into account. Moreover, Keynes pointed out that Pigou evaded the equation of the value of money in general by measuring R and K in terms of a single commodity like wheat.

Keynes' Cash Balance Equation

In his book, *A Tract on Monetary Reform*, Keynes formulated the following equation called as *Real Balance Equation* :

$$n = p\,(k + rk') \qquad ...(vi)$$

where n represents the amount of cash in circulation; p is the price of a consumption unit (constituted by a collection of specified quantities of the standard articles that enter into consumption of the community); k is the amount of consumption units that the people decide to hold in the form of cash ; and k' is the amount of consumption units that the people decide to hold in the form of bank deposits and r is the cash reserve ratio of the banks.

The magnitude of r depends upon the reserve practices followed by the banking system and the proportion between k and k' depends upon the banking arrangements and habits of the people. If the magnitudes of r, k and k' remain constant, n and p rise and fal together in the same proportion. Keynes also contended that cyclical variations could not be due to changes in n or r but to the changes in k and k'.

Keynes' real balance equation suffers from certain defects. Actually Keynes himself recognized its defects and made a mention of them in his *Treatise*. The major *defects* are given below :

(*i*) The variable p has been used in a very restricted sense. It does not measure the general purchasing power of money but refers to the price level of consumption units alone.

(*ii*) The equation relates only to the consumption goods and fails to take into account industrial and financial transactions.

(*iii*) Since the variable p measures only the price level of consumption units, it suggests that the people hold money simply to procure consumption goods. But the money, in fact, is held for "a vast multiplicity of business and personal purposes."

(*iv*) Keynes' real balance equation makes a misapplication of the conception to the cash-deposits as a whole which was appropriate only to the income deposits.

(*v*) Keynes also recognized that the proportional relationship between n and p is invalid particularly in the short period when k, k' and r might undergo change as a result of variations in n. Actually p may change disproportionately to the change in n depending upon the volatile behaviour of k, k' and r.

In view of these deficiencies in the real balance equation, Keynes abandoned this approach to money and price altogether in his *General Theory*. Instead, he developed income-expenditure approach to provide an appropriate explanation for the

relationship between the quantity of money and the price level.

Robertson's Cash Balance Equation

Another noted advocate of the Cambridge approach is D. H. Robertson. He gave the following cash balance equation :

$$M = KTP \qquad ...(vii)$$

or $$P = \frac{M}{KT}$$

where P is the price level ; M is the supply of money ; and T is the amount of goods and services which is to be purchased during a year *i.e.,* it is the volume of annual transactions. K is the fraction of T over which people want to hold command in the form of cash balances.

The Robertsonian cash balance equation is sometimes considered as better than the equations given by other Cambridge writers primarily because of its easy and straight comparability with that of Fisherine approach. Fisher's transactions equation $P = \frac{MV}{T}$ and Robertson's equation, $P = \frac{M}{KT}$ involve the same variables, if we consider V as the reciprocal of K *i.e.,* 1/K = V. Just as Fisher postulates a direct and proportional relationship between M and P on the assumption of the constancy of V and T, similarly Robertson's equation too explains a direct and proportional relation between M and P, if T and K are supposed as constant. The main difference between the two approaches is that Fisher's approach attaches importance to the spending of money, while Robertsonian approach gives importance to the holding (or non-spending) of money.