

THE QUANTITY THEORY OF MONEY - FISHER'S EQUATION OF EXCHANGE – CASH BALANCE APPROACH

The Quantity Theory of Money seeks to explain the factors that determine the general price level in a country. The theory states that the price level is directly determined by the supply of money. The quantity theory of money is based directly on the changes brought about by an increase in the money supply. The quantity theory of money states that the value of money is based on the amount of money in the economy. Thus, according to the quantity theory of money, when the supply of money increases the, the value of money falls and the price level increases. We know that inflation is persistent rise in the price level. Hence, on the basis of this definition, the quantity theory of money also states that growth in the money supply is the primary cause of inflation.

Value of Money

The basic causal relationship between the price level and the value of money is that as the price level goes up, the value of money goes down. The "value of money" refers to what a unit of money can buy whereas the "price level" refers to the average of all of the prices of goods and services in a given economy. A unit of money has its denomination printed on it known as the "face value," but the unit only has tangible value in relation to what a person can buy with it. This is called its "purchasing power." The purchasing power of a given currency changes over time due to variations in supply and demand, but in general it slowly loses value as the price level rises.

Price Level

In contrast to the value of money, which is expressed in units, the price level is an aggregate. Because it is difficult, confusing and nearly impossible to accurately average all prices for all goods and services in an economy, the price level is most commonly analyzed by finding the price of a theoretical collection of goods and services. The price level inevitably increases over time due to inflation, though in most economies this increase is gradual.

Relationship

As the price level increases over time, the value of money decreases. In most countries, the price level increases slowly with inflation and changes in supply and demand. Like most things in economics, there is a market for money. The supply of money in the money market comes from the Central Bank. The Central Bank has the power to adjust the money supply by increasing or decreasing it. The demand for money in the money market comes from consumers. The determinants of money demand are infinite. In general, consumers need money to purchase goods and services. If there is an ATM nearby or if credit cards are plentiful, consumers may demand less money at a given time than they would if cash were difficult to obtain. The most important variable in determining money demand is the average price level within the economy. If the average price level is high and goods and services tend to cost a significant amount of money, consumers will demand more money. If, on the other hand, the average price level is low and goods and services tend to cost little money, consumers will demand less money. The value of money is ultimately determined by the intersection of the money supply, as controlled by the Central Bank and money demand, as created by consumers. The value of money, as revealed by the money market, is variable. A change in money demand or a change in the money supply will yield a change in the value of money and in the price level. The change in the value of money and the change in the price level are of the same magnitude but in opposite directions.

Velocity

The most important variable that intervenes the effects of changes in the money supply is the velocity of money. Velocity of money is defined simply as the rate at which money changes hands. If velocity is high, money is changing hands quickly, and a relatively small money supply can fund a relatively large amount of purchases. On the other hand, if velocity is low, then money is changing hands slowly, and it takes a much larger money supply to fund the same number of purchases. The velocity of money is not constant. Instead, velocity changes as consumers' preferences change. It also changes as the value of money and the price level change. If the value of money is low, then the price level is high, and a larger number of bills must be used to fund purchases. Given a constant money supply, the velocity of money must increase to fund all of these purchases. Similarly, when the money supply shifts due to the Central Banks policy, velocity can change. This change makes the value of money and the price level remain constant.

The relationship between velocity, the money supply, the price level, and output is represented by the equation $M * V = P * Y$ where M is the money supply, V is the velocity, P is the price level, and Y is the quantity of output. $P * Y$, the price level multiplied by the quantity of output, gives the nominal GDP. This equation can thus be rearranged as $V = (\text{nominal GDP}) / M$. Conceptually, this equation means that for a given level of nominal GDP, a smaller money supply will result in money needing to change hands more quickly to facilitate the total purchases, which causes increased velocity. The equation for the velocity of money, while useful in its original form, can be converted to a percentage change formula for easier calculations. The velocity equation can be used to find the effects that changes in velocity, price level, or money supply have on each other. When making these calculations, remember that in the short run, output (Y), is fixed, as time is required for the quantity of output to change.

Let's try an example. What is the effect of a 3% increase in the money supply on the price level, given that output and velocity remain relatively constant? The equation used to solve this problem is (percent change in the money supply) + (percent change in velocity) = (percent change in the price level) + (percent change in output). Substituting in the values from the problem we get $3\% + 0\% = x\% + 0\%$. In this case, a 3% increase in the money supply results in a 3% increase in the price level. Remember that a 3% increase in the price level means that inflation was 3%.

In the long run, the equation for velocity becomes even more useful. In fact, the equation shows that increases in the money supply by the Central Bank tend to cause increases in the price level and therefore inflation, even though the effects of the Central Bank's policy is slightly dampened by changes in velocity. This results a number of factors. First, in the long run, velocity, V , is relatively constant because people's spending habits are not quick to change. Similarly, the quantity of output, Y , is not affected by the actions of the Central Bank since it is based on the amount of production. This means that the percent change in the money supply equals the percent change in the price level since the percent change in velocity and percent change in output are both equal to zero. Thus, we see how an increase in the money supply by the Central Bank causes inflation.

The velocity of money equation represents the heart of the quantity theory of money. By understanding how velocity mitigates the actions of the Fed in the long run and in the short run, we can gain a thorough understanding of the value of money and inflation. There are two versions of the Quantity Theory of Money: (1) The Transaction Approach and (2) The Cash Balance Approach. Let us discuss them in detail.

QUANTITY THEORY OF MONEY (QTM)

Fisher's Equation of Exchange or the Transaction Approach

Irving Fisher an American economist put forward the Cash Transaction Approach to the quantity theory of money. He in his book *The Purchasing Power of Money* (1911) has stated that the value of money in a given period of time depends upon the quantity of money in circulation in the economy. It is the quantity of money which determines the general price level and the value of money. Any change in the money supply directly affects the general price level and the value of money inversely in the same proportion. In Fisher's words, —Other things remaining unchanged, as the quantity of money in circulation increases, the price level also increases in direct proportion and the value of money decreases and vice versa. For example, if the quantity of money in circulation is doubled other things being equal the general price level will be doubled and the value of money is halved. Similarly if the quantity of money is halved the price level will be halved and the value of money doubled. In Fisher's Cash Transactions Version of Money, the general price level in a country, like the prices of commodities, is determined by the supply of and demand for money.

(a) Supply of Money: The supply of money consists of the quantity of money in circulation (M) and the velocity of its circulation (V) i.e., the number of times the money changes hands. Thus MV refers to the total volume of money in circulation during a period of time. For example, if the total money supply in Pakistan Rs. 5,000 billion and its velocity per unit of time is 10 times, then the total money supply would be $\text{Rs.}5,000 \times 10 = \text{Rs.}50,000$ billion.

(b) Demand for Money: People demand money not for its own sake. They demand money because it serves a medium of exchange. It is used to carry every day transactions. In short, the demand for money is for the exchange of goods.

Assumptions of the theory

(1) Full employment: The theory is based on the assumption of full employment in the economy

(2) T and V are constant: The theory assumes that volume of trade (T) in the short run remains constant. So is the case with velocity of money (V) which remains unaffected.

(3) Constant relation between M and M1. Fisher assumes constant relation between currency money M and credit money (M1).

(4) Price level (P) is a passive factor. The price level (P) is inactive or passive in the equation. P is affected by other factors in equation i.e., T, M, M1, V and V1 but it does not affect them.

Equation of Exchange:

The Cash transaction version of the quantity theory of money was presented by Irving Fisher in the form of an equation. Thus Fisher's transaction approach to the Quantity Theory of Money may be explained with the following equation of exchange.

$$MV = PT$$

Where,

M is the total supply of money

V is the velocity of circulation of money

P is the general price level

T is the total transactions in physical goods.

This equation is an identity, that is, a relationship that holds by definition. It means, in an economy the total value of all goods sold during any period (PT) must be equal to the total quantity of money spent during that period (MV). Fisher assumed that (1) at full employment total physical transactions T in an economy will be a constant, and (2) the velocity of circulation remain constant in the short run because it largely depends on the spending habits of the people. When these two assumptions are made the Equation of Exchange becomes the Quantity Theory of Money which shows that there is an exact, proportional relationship between money supply and the price level. In other words, the level of prices in the economy is directly proportional to the quantity of money in circulation. That is, doubling the total supply of money would double the price level.

It may be noted that the above Fisher's Equation include only primary money or currency money. But modern economy extensively uses demand deposits or credit money. It was on account of the growing importance of credit money that Fisher later on extended his equation of exchange to include credit money. Thus, the equation of exchange can be represented as follows:

$$P = \frac{MV + M1 V1}{T} \quad \text{or} \quad PT = MV + M1 V1$$

Here,

P is the price Level

M is the quantity of money

V is the velocity of circulation of M

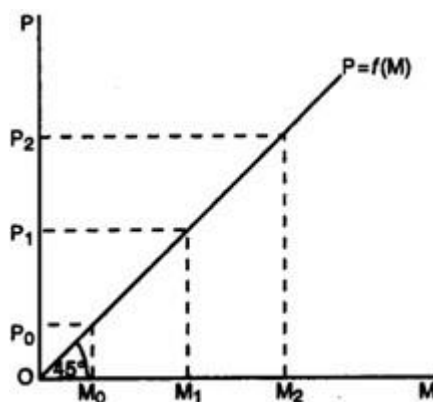
M1 is the volume of credit money

V1 is the velocity of circulation of M1

T is the total volume of goods and Trade

Fisherian relation between M and P can be explained with the help of a diagram. The figure below shows equi-proportionate changes between M and P. As quantity of money increases from M_0 to M_1 , price level rises from P_0 to P_1 . Similarly, when the quantity of money increases from M_1 to M_2 , the price level increases from P_1 to P_2 making the changes in the quantity of money equal to the changes in the price level.

Figure 3.4 Relationship between Quantity of Money and Price Level



Fisher's Transaction Approach can explain the causes of hyperinflation that occurs during war or emergency. It can also explain certain long term trend in prices. But it cannot explain normal peace time inflation. This shortcoming has been modified by the Cambridge version or the Cash-Balance Approach.

Criticism of the theory:

The quantity theory is subjected to the following criticism.

- (1) **Unrealistic assumptions:** The theory is based on unrealistic assumptions. In this theory P is considered as a passive factor. T is independent. M , V , V_1 , are constant in the short run. All these assumptions are covered under –Other things remaining the same. In actual working of the economy, these do not remain constant; hence, the theory is unrealized and misleading.
- (2) **Various Variables in the transaction are not independent.** The various variables in transaction equation are not independent as assumed in the theory. The fact is that they very much influence each other. For example when money supply (M) increases the velocity of money (V) also goes up. Take another case. Fisher assumes (P) is a passive factor and has no effect on trade (T). In actual practice, when price level (P) rises, it increases profits and promotes trade (T).
- (3) **Assumption of full employment is wrong.** J. M. Keynes has raised an objection that the assumption of full employment is a rare phenomenon in the economy and the theory is not real.
- (4) **Rate of interest ignored.** In the quantity theory of Fishers, the influence of the rate of interest on the money supply and the level of prices have been completely ignored. The fact is that an increase or decrease in money supply has an important bearing on the rate of interest. An increase in money supply leads to a decline in the rate of interest and vice versa.
- (5) **Fails to explain trade cycles.** The theory fails to explain the trade cycles. It does not tell as to why during depression, the increase in money supply has little impact on the price level. Similarly, in boom period the reduction in money supply or tight money policy may not bring down the price level. G. Crowther is right in saying, –The quantity theory is at best an imperfect guide to the cause of the business cycle.
- (6) **Ignores other factors of price level.** There are many determinants other than M , V , and T which have important implication on the price level. These factors such as income, expenditure, saving, investment, population consumption etc have been ignored from the purview of the theory.

The Cash Balance Approach (Cambridge Approach)

Fisher's approach can be viewed as deterministic. Essentially, Fisher argued that, given the full employment volume of transactions and the speed with which the financial system could process payments, the quantity of money that agents required to hold was effectively determined. Alfred Marshall, A.C. Pigou, D.H. Robertson and J.M. Keynes at Cambridge School made an alternative formulation of the quantity theory of money which is known as Cash Balance equation. Like Fisher, the Cambridge School assumed that money was only held to expedite transactions and had no further purpose. Thus, if the money supply increased, agents holding the increased money stock would seek to get rid of it. However, the emphasis in this approach concentrated on establishing the quantity of money that agents would voluntarily *desire* to hold. The Cambridge school were in effect attempting to set out a theory of the demand for money.

The Cambridge approach emphasises that there are alternatives to holding money in the shape of shares and bonds. These assets yield a return which can be viewed as the opportunity cost of holding money. As interest rates rise, agents will economise on money holdings and vice versa. Another factor that will influence money holdings is the expected rate of inflation. If inflation is expected to be high, then the purchasing power of money will fall. This will prompt agents to buy securities or commodities as a hedge against inflation. The Cambridge economists regarded the determination of value of money in

terms of supply and demand. The supply of money is exogenously determined by the banking system. Therefore, the concept of velocity of circulation is altogether discarded in the cash balances approach. On the other hand, the concept of demand for money plays the major role in determining the value of money. The demand for money is the demand to hold cash balance for transactions and precautionary motives. Thus, the cash balance approach considers the demand for money not as a medium of exchange but as a store of value. The Cambridge equations show that given the supply of money at a point of time, the value of money is determined by the demand for cash balances. When the demand for money increases, people will reduce their expenditures on goods and services in order to have larger cash holdings. Reduced demand for goods and services will bring down the price level and raise the value of money. On the contrary, fall in the demand for money will raise the price level and lower the value of money.

Marshall's Equation

We may express the idea of Marshall in the form of an equation as follows:

$M = kPY$ where M stands for the exogenously determined supply of money, k is the fraction of the real money income (PY) which people wish to hold in cash and demand deposits, P is the price level, Y is the aggregate real income of the community. Thus, the price level $P = \frac{M}{kY}$ or the value of money (the reciprocal or price level) is $\frac{1}{P} = \frac{kY}{M}$.

Pigou's Equation

Pigou was the first Cambridge economist to express the cash balance approach in the form of an equation and his equation can be expressed as:

$P = \frac{kR}{M}$ where P is the purchasing power of money (the value of money which is the reciprocal of the price level), k is the proportion of total real resources or income (R) which people wish to hold in the form of titles or legal tender, (R Real Income), and M refers to the number of actual units in legal tender money.

The demand for money, according to Pigou, consists not only of legal money or cash but also bank notes and bank balances. In order to include bank notes and bank balances in the demand for money, Pigou modifies his equation as:

$$P = \frac{kR}{M} \{c + h(1 - c)\}$$

Where, c is the proportion of total real income actually held by people in legal tender including token coins, $(1-c)$ is the proportion kept in bank notes and bank balances, and h is the proportion of actual legal tender that bankers keep against the notes and balances held by their customers.

Pigou's equation explains the reason behind the value of money and also the motive behind people keeping larger or smaller proportions of their income in the form of money. During a period of rising prices, as the value of money decreases, people want to hold smaller proportion of their income in the form of cash while during the period of depression, as the value of money is rising; people want to keep larger proportion of their income in the form of cash.

Criticisms of Cash Balance Approach

The main drawbacks of the cash balance theory are as under:

- (1) Use of Purchasing Power for consumption goods. The Cambridge economists give undue importance the purchasing power of money in term of consumption goods. The theory ignores speculative motive of demand for money.
- (2) Role of rate of interest ignored. The cash balance theory excludes the role of rate of interest in explaining the changes in the price Level which is very important in Inf the demand for money.
- (3) Unitary elasticity of demand. The Cambridge equation assumes that the elasticity demand for money is unity. This is not realistic in the dynamic society of today.
- (4) Real income not the sole determinant of K. According to the Cambridge equation, real income only determines the value of K i.e., the cash held by people. The fact is that other factors as price level; banking and business habits of the people, political conditions in the country can influence the value of K.
- (5) Simple Truism. The Cambridge equation, like the Fisherian equation establishes proportionate relationship between the quantity of money and the price level. $M = KPY$. The theory does not explain as to how and why this relationship between the two is established.
- (6) K and T assumed constant. The Cambridge economist like Irving Fisher also assumes that K and T remain constant. This is possible in a static situation but not in dynamic conditions.
- (7) No explanation of business cycles. The Cambridge equations do not provide any explanation for the business cycles.

Comparison between Transactions and Cash Balance Approaches

There are similarities as well as dissimilarities between the Transactions and Cash balance approaches.

Similarities

1. Same conclusion about M and P: The basic conclusion in both the approaches is the same that the value of money or the price level is a function of the quantity of money.
2. Similar Equations: The two approaches use almost similar equations.
3. Both approaches consider that money serves as a medium of exchange in the economic system.

Dissimilarities

There are a lot of differences between the Transactions approach and Cash Balance approach of the quantity theory of money which are given below.

1. Functions of Money: The Fisherian approach lays emphasis on the medium of exchange function of money while the Cambridge approach emphasises the store of value function of money.
2. Flow and Stock: In Fisher's approach money is a flow concept while in the Cambridge approach it is a stock concept.
3. V and k Different: In Fisher's equation V refers to the rate of spending and in Cambridge equation k refers to the cash balances which people wish to hold.
4. Nature of Price level: In Fisher's equation, P refers to the average price level of all goods and services. But in the Cambridge equation P refers to the prices of final or consumer goods.
5. Nature of T : In Fisher's equation, T refers to the total amount of goods and services exchanged for money, whereas in the Cambridge equation T refers to the final or consumer goods exchanged for money.