In the last lecture we saw that monetary policy has only an inflationary effect, and no real effect in the long run. In this lecture we shall continue further with our evaluation of monetary policy over the long run. For that purpose we shall study a theory titled as the ‘Quantity Theory of Money’.

Statement: The quantity theory of money is the proposition that in the long run, an increase in the quantity of money brings an equal percentage increase in the price level, and does not have any real effects.

The basis for the QTM is the following equation, called the ‘equation of exchange’:

\[ MV = PY \]

Where, M = Money supply
P = Price level
Y = Real output
V = Velocity of circulation of money

What is the velocity of circulation of money?
It is the average number of times a dollar’s worth of money is used annually to buy goods & services that make up GDP.

What does this equation mean?
On the right hand side of the equation we have RGDP (Y) multiplied by the price level. So this is the nominal GDP, or the value of goods & services produced during a certain year expressed in dollar terms.

On the left hand side we have the amount of money that is in circulation during the year, times the average number of times every dollar of this money supply is used to effect an exchange of goods & services.

Thus the equation is saying that the dollar value of goods & services that are being supplied in the economy (RHS) equals the demand for such goods & services, measured in dollar terms (LHS). This must be true if all transactions involving the exchange of goods & services require money as the medium of payment for such goods & services.

Now, let us rearrange the equation and write it as follows:

\[ M = (1/V)PY \]
In this equation, the LHS is the money supply of the economy, while the RHS is the demand for money (i.e., the demand for dollars is given by the dollar value of goods & services demanded, divided by the number of time a single dollar is used and reused in the transactions that lead to the exchange of those goods & services: So if there is $20000 worth of transactions going on, but each dollar is used 5 times in those transactions, then the amount of money required for engaging in those transactions is actually $4000).

The quantity theory of money makes these following assumptions:

1. The velocity of circulation of money is constant.
2. In the long-run output in the economy does not adjust (as it does in the short-run), but is fixed at the potential level of output $Y^*$.

Thus, the quantity theory equation is:

$$M = \frac{1}{V}PY^* \quad \text{(1)}$$

Therefore,

$$\Delta M = \frac{Y^*}{V} \Delta P \quad \text{(2)}$$

(Since $Y^*/V$ is constant in the long-run as per the assumptions)

So, \(\Delta M/M = \Delta P/P\) (Dividing equation 2 by equation 1)

Thus, for an economy in the long-run equilibrium, a change in money supply only changes the price level and has no real output effects.

In order to link this study to the AD-AS analysis, we can write the equation of exchange as:

$$P = \frac{M}{V}(1/Y)$$

Now, this can be looked upon as the aggregate demand equation since it describes a relationship (inverse in nature) between $P$ and $Y$.

In the short run (when $Y$ may adjust) if $M$ changed, $Y$ (output supplied) could change to restore equality in the above equation. Of course, if the percentage of this change did not exactly equal the percentage change in money supply, there would still be an increase in the price level.

(If the percentage change were exactly equal, we would be in an environment where the supply curve in the goods market would be horizontal, as we saw in an earlier lecture).

However, in the long run with $Y$ fixed at the potential level, a percentage change in $M$ has to be matched by an exact percentage change in the price level for the equality to
hold in the exchange equation. What this means is that for an X% change in money supply, the demand curve would shift up in the long run AD-AS diagram so as to intersect the LRS curve such that there is an increase of exactly X% in the price level (compared to the initial equilibrium).

Note: The SRS supply curve would shift back for reasons described in lecture 17, compared to the initial equilibrium.

(The diagram here is exactly the same as the last diagram seen in lecture 17)