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ON THE ART OF CENTRAL BANKING

TOSHIYA HANAWA*


The recognition that the monetary system has an important relationship with both stability and growth of the national economy is not a new one. D. H. Robertson said the following.

For a monetary system is like a liver: it does not take up very much of our thoughts when it goes right, but it attracts a deal of attention when it goes wrong.¹

We are reminded of the importance of the monetary system in the face of instability and stagnation of the economy.

Scholars who believe in the Currency Principle stressed that the money supply in the economy had to be dependent on the amount of gold in its economy to preserve the stability of the economy, and thought that a pure metal monetary system was an ideal one. They considered that a 100% specie reserve monetary system was ideal, and bank money had to be managed like specie under a mixed system with both bank money and specie in circulation.

On the contrary, scholars who believe in the Banking Principle seemed to stress that money should be supplied according to the social needs of money dependent on social transactions. They considered that credit would be expanded automatically with the expansion of economic activity, and contracted automatically with the contraction of economic activity.

As regards the automatic expansion and contraction, there seemed to be desirable and undesirable. Therefore, management of credit was needed, and this management was to be carried out by the Central Bank, not using the mechanical rule.

The difference between the currency principle (the management of money supply by the amount of gold) and the banking principle (the management of money supply by the Central Bank) is that the former is supported by the theoretical sense, and the latter is supported by the real practice. Although, Central Bank is unnecessary according to the rigid currency principle, and a monetary commission using the mechanical rule is necessary, in reality Central Banks have progressed to practice central banking policies beyond the power of a monetary commission. Central Banks under the Gold Standard preserved stability of the value of money to stabilize and expand the economy.

In the early days of capitalism, the stability of the monetary system provided for the stability and growth of the economic system. But, they don’t always go hand in hand and, by and by, chronic underemployment showed this. Keynes working on the idea of full employment, insisted that the money supply in the economy should not be dependent on

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gold, and monetary authorities should have the power to supply money to attain and preserve full employment. That was the substance of his attack on the Gold Standard, and his insistence on a managed monetary system. In other words, he wanted the Central Bank to be the almighty power behind monetary policy.

Now, the classic currency principle and the classic banking principle seemed to be synthesized by Keynes. Because Keynes theory contains the classic currency principle on one side, and the classic banking principle on the other side. As regards the former, Keynes thought that money supply should be the norm. Keynes' norm was to attain and preserve full employment, and prevent gold hoarding. And as regards the latter, Keynes placed stress on the needs of society by introducing the liquidity preference theory and at a level that preserved effective demand for full employment as the optimum supply of money. According to the classic banking principle, the optimum supply of money was considered as the micro behaviour of banks, i.e., banks should supply bank money to finance current production, but not to finance the fixed equipment. In other words, the fixed equipment should be financed from saving funds, but not by credit creation by banks. Thus, a managed monetary system against the Gold Standard was the framework to guarantee discrete monetary policy, and a symbol of the era of economic policy.

But, the discrete monetary policy was criticized, because that democratic system might prevent monetary policy from operating properly. And sometimes, the time lag of the effects of monetary policy made business cycle rather more unstable instead of more stable. Friedman proposed the rule of monetary policy instead of discrete monetary policy. Therefore, the modern currency school was founded and became the opposite of Keynesian economics, the modern banking school. This paper is to make clear the art of central banking of Keynes, Keynes' monetary thoughts.

II. The Art of Central Banking in Classical Economics:

Two Faces of the Gold Standard

Classical economics does not consider real factors, but rather monetary factors as disturbances of the national economy, as long as the price mechanism operates smoothly. Classical economics considered the art of central banking seemed to be one of the most important problems and it produced the Gold Standard. The Gold Standard is considered a symbol of the classical monetary system. Sometimes, a Silver Standard and/or a Gold-Silver Bimetallic Standard were used instead.

The Gold Standard is based on the following two conditions, firstly that there is free coinage and free melting and secondly that there is free mobility of gold among countries. The former assures full convertibility between gold and money, and shows the art of central banking by gold. The latter shows the role of gold as international money. In case gold coins are used in a real world, like a pure metal monetary system, free coinage and free melting have a significant meaning. These costs of gold production are a micro criterion. But, when money changed from metal money into credit money, the significance of this micro criterion disappeared, and the macro criterion that monetary authorities should be ready for the buying and selling of gold at the appointed price of gold without restriction became important. And the quantity theory of money analyses theoretical reasonings of this macro
criterion.

Because a pure gold monetary system has never been realized, the macro criterion of
gold seems to have been rather more significant than the micro criterion in the real Gold
Standard.

Let's show the art of central banking as in classical economics, according to the quantity
theory of money.

The quantity theory of money is the monetary theory of classical economics, and can
be written as

\[ MV = Py \]  
\[ M = kPy \]

\( M \): money supply  
\( V \): income velocity  
\( k \): Marshallian k  
\( P \): the general price level  
\( y \): real income

\( V \) and \( k \) seem to be constant, as long as the social habits of transaction remain un-
changed. And, \( y \) is assumed as full employment income. The importance of the quantity
theory of money is that the change in \( P \) is caused by the change in \( M \).

Equations (1.1) and (1.2) show that \( V = \frac{1}{k} \), but \( V \) and \( k \) do not mean the same thing;
that is, \( V \) shows the average circulation velocity of money while \( k \) shows the public's desire
of holding money. So we can see that the art of central banking or the management of the
money supply seems to be very important in safeguarding the value of money in classical
economics.

Generally speaking, \( M \) consists of both cash money (\( C_p \)) and bank money (\( D \)) and their
velocities are \( V' \) and \( V'' \) respectively (\( V'' > V' \) as usual). Now, cash money/bank money
held by public is assumed unchanged, and the bank's requirement for payment (\( R \))/bank
money (\( D \)) (that is, bank's reserve ratio for payment of banks) is assumed to remain un-
changed. So we can conclude that \( M \) in our economy can be managed by the management
of high-powered money (\( H \)) supplied by the central bank.

\[ M = C_p + D \]  
\[ H = C_p + R \]  
\[ \frac{C_p}{D} + 1 \cdot H \]  
\[ \frac{C_p}{D} + \frac{R}{D} \cdot H \]

Now, we can manage \( M \) in our economy by the management of \( H \), with which we can
safeguard the value of money.

At a low level of financial development, money can only have the transaction function
of money, and \( V \) is constant. When borrowing and lending are common, money will also
have the value of store function. Storing money may lower income velocity, and may give
the economy a deflationary bias. Now consider an economy with a developed capital mar-
ket, where lenders and borrowers appear. A lender may accept the promise to pay issued
by borrowers in exchange for hoarding money, but he will require a payment of interest in
compensation for the liquidity that he is giving up. J. R. Hicks\(^2\) insists that the payment of interest gives lenders an incentive to save, but interest will not be earned if the borrowed funds are intended to be idle. It is natural that borrowed funds must have the profitable opportunities of spending. Sometimes the lender’s promise to pay may become a kind of money (especially a banker’s promise to pay will be regarded as a money substitute), so that money supply will increase in excess of holding money and give the economy an inflationary bias, and \( V \) will increase.

In such a developed financial system, \( V \) cannot be regarded as a constant, but will change in response to the business cycle, that is, \( V \) will increase in boom periods, and will decrease in recession periods. But, we must pay attention to the fact that the change of \( V \) cannot be infinite; i.e., it will be under some restriction. Necessarily monetary authorities must manage \( H \) and/or \( M \), with consideration of this restricted change of \( V \).

### III. The Art of Central Banking in the Tract\(^3\)

Keynes was clearly one of the eminent classical economists, because he considered the art of central banking based on the quantity theory of money in the Tract. The Tract was written as a criticism against the reconstruction of Gold Standard, and insisted that Great Britain had to keep the price level stable by the management of money supply along with flexible exchange rate, and that it must not use deflationary policy to stabilize the exchange rate.

Then, why is the reconstruction of the Gold Standard by deflationary policy a bad policy? Keynes made it clear through the effects on the 3 classes of capitalistic society; the business class, the investing class, and the earning class.

We conclude that inflation redistributes wealth in a manner very injurious to the investor, very beneficial to the business man, and probably, in modern industrial conditions, beneficial on the whole to the earner. Its most striking consequence is its injustice to those who in good faith have committed their savings to titles to money rather than to things.\(^4\)

On the other hand deflation, as we shall see in the second section of the next chapter, is liable, in these days of huge national debts expressed in legal-tender money, to overturn the balance so far the other way in the interests of the rentier, that the burden of taxation becomes intolerable on the productive classes of the community.\(^5\)

The capitalistic system, as developed during the nineteenth century was divided to separate the management of property from its ownership; the former was called the business class and the latter the investing class. Of course, these classes overlap, and the same individual may earn, deal, and invest, but in the present organization of society, such a division corresponds to an actual divergence of interest. With the idea that the investing class is a part of the earning class, we cannot recognize the right feature of capitalistic society.

By this (investment) system the active business class could call to the aid of their enter-

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\(^4\) Keynes, J. M., ibid., p. 29.

\(^5\) Keynes, J. M., ibid., p. 30.
prises not only their own wealth but the savings of the whole community; and the professional and propertied classes, on the other hand, could and an employment for their resources, which involved them in little trouble, no responsibility and (it was believed) small risk.

Thus Keynes recognized rightly the essence of a capitalistic society, but the monetary theory presented in the tract was simply the classical quantity theory of money.

\[ n = p(k + rk') \]

- \( n \): currency notes or other forms of cash in circulation with the public
- \( p \): the price of each consumption unit
- \( k \): real cash balance of cash money
- \( r \): bank’s cash reserve ratio
- \( k' \): real cash balance of bank money

So long as \( k, k' \) and \( r \) remain unchanged, \( n \) and \( p \) rise and fall together. Since the quantity theory stated that \( n \) is an independent variable the arbitrary doubling of \( n \) must have the effect of raising \( P \) to double what it would have been otherwise. Keynes spoke of an increase or decrease in \( n \) as inflation or deflation of cash; and of an increase or decrease in \( k \) and \( k' \) as inflation or deflation of real balances.

Considering the effect of \( n \) on \( P \), he insisted that the stability of the value of money was very important, and monetary authorities should manage \( M \) for the stability of the value of money.

It is very important to mention that Keynes insisted not only the stability of the actual value of money, but also on the necessity to prevent general distrust about the value of money because of instability.

During the lengthy process of production the business world is incurring outgoings in terms of money—paying out in money for wages and other expenses of production—in the expectation of recouping this outlay by disposing of the product for money at a later date. That is to say, the business world as a whole must always be in a position where it stands to gain by a rise of price and to lose by a fall of price. Whether he likes it or not, the technique of production under a regime of money contract forces the business world always to carry a big speculative position.

Now it follows from this, not merely that the actual occurrence of price changes profits some classes and injures others, but that a general fear of falling prices may inhibit the productive process altogether. For if prices are expected to fall, not enough risk-takers can be found who are willing to carry a speculative ‘bull’ position, and this means that entrepreneurs will be reluctant to embark on lengthy productive processes involving a money outlay long in advance of money recoupment—whence unemployment. The fact of falling prices injures entrepreneurs; consequently the fear of falling prices causes them to protect themselves by curtailing their operations.

This part showed that although Keynes had a classical view, he stressed the expectation element. But he considered the art of central banking with regards to \( M \), because he supported the quantity theory of money in the Tract. So he started an analytical innovation.
IV. The Art of Central Banking in the Treatise

Many of Keynes' papers were concerned with postwar economic policy, but the Treatise was rather an academic book, though it was more political economics with the proposal of a super national central bank rather than pure economics.

The fundamental problem in the Treatise was that of the "credit cycle," that is the fluctuation in employment, output and prices. From another point of view, it was a criticism on the quantity theory of money, which was the traditional monetary theory and of which he himself had been an advocate also in the Tract.

The first criticism on the quantity theory of money was basically on the definition of the value of money, that is the purchasing power of money. The quantity theory referred to the level in connection with the currency standard, which Keynes divided into the cash transactions standard and the cash balances standard.

These currency standards must necessarily differ from the purchasing power of money, because the relative importance of different articles as objects of monetary transactions is not the same as their relative importance as objects of consumption. It is evident that the systems of weighting appropriate to a consumption standard and to a currency standard respectively can differ materially from one another. Keynes proposed as the right definition of the value of money a consumption standard which weight different articles in proportion to their importance to consumers. From the welfare point of view, a consumption standard is important, and it is consistent with the general price level.

The second criticism by Keynes was on the motivational force of the economy, that is profits, which the quantity theory neglects. Real balances of money do not cause firms to expand or contract their output, but the profits and losses of firms do. Moreover, it is not actual profits and losses which are important, but rather the expected ones. Now profits are the difference between the "demand price" (i.e., market price) of a unit output and its "supply price" (i.e., cost of production). Therefore, he studied of the differential movements of price and costs by the use of his "fundamental equations of prices." These equations show the third criticism on the quantity theory of money.

\[ E: \text{the total money income} = \text{earnings of the community exclusive of windfall profit} = \text{costs of production}. \]

\[ I': \text{the part of} \ E \text{earned by the production of investment goods} = \text{the cost of production of new investment}. \]

\[ E-I' \text{the part of} \ E \text{earned by the production of consumption goods} = \text{the cost of production of consumption goods} \]

\[ O: \text{the total output of goods} \]

\[ R: \text{the consumption goods} \]

\[ C: \text{the net investment goods} \]

\[ O: R+C \]

\[ P: \text{the price level of consumption goods} = \text{the inverse of the value of money by Keynes} \]

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12 Keynes, J. M., ibid., p. 68.
13 Keynes, J. M., ibid., Chap. 10.
The fundamental problem of monetary theory is not merely to establish identities or statical equations relating to (e.g.) the turnover of monetary instruments to the turnover of things traded for money. The real task of such a theory is to treat the problem dynamically, analysing the different elements involved, in such a manner as to exhibit the causal process by which the price level is determined, and the method of transition from one position of equilibrium to another.\(^{14}\)

I propose, therefore, to break away from the traditional method of setting out from the total quantity of money irrespective of the purposes on which it is employed, and to start instead with the flow of the community's earnings or money income, and with its twofold division (1) into the parts which have been earned by the production of consumption goods and of investment goods respectively, and (2) into the parts which are expended on consumption goods and on savings respectively.\(^{15}\)

The profits in the consumption sector \(Q_1\) can be written as

\[ Q_1 = PR - (E - I') = I' - S \]

Also, the profits and losses in consumption sector \(Q_1\) are the difference between the current expenditure on consumption goods \(PR\) and the income in the consumption goods sector \(W_1R\)

\[ Q_1 = PR - W_1R \]

\[ \therefore PR = W_1R + Q_1 \]

Therefore, we can get Keynes' first fundamental equation.

\[ P = W_1 + \frac{Q_1}{R} = \frac{E}{0} + \frac{I' - S}{R} \] \(3.1\)

We can get Keynes' second fundamental equation.

\[ \Pi = \frac{PR + P'C}{0} = \frac{(E - S) + I}{0} \]

\[ = \frac{E}{0} + \frac{I - S}{0} \] \(3.2\)

We can rewrite equations (3.1) and (3.2).

\(^{14}\) Keynes, J. M., ibid., p. 120.

\(^{15}\) Keynes, J. M., ibid., p. 121.
According to these fundamental equations, Keynes considered the art of central banking and four conditions for the stability of the price level (i.e., the value of money).

The first condition of the price level is that profit $Q_1, Q_2$, and $Q$ should all be zero. This means that the value of money and the price level of output as a whole will correspond to $W_1 = W_0$, that is $P = \Pi = W_1 = \frac{1}{e} W$.

The second condition for a stable price level can be shown as $I' = S$, $I = I'$, and $I = S$, because $Q_1 = I' - S = 0$, $Q_2 = I - I' = 0$, $Q = I - S = 0$.

The third condition of the price level can be shown as the natural rate of interest ($r$) = the market rate of interest ($i$). The natural rate of interest is not the same as the terminology of Wicksell's real rate of interest, but it is the monetary rate of interest compared to the market rate of interest. In other words, Keynes' natural rate of interest means the marginal efficiency of capital in the General Theory. Thus the natural rate of interest is the rate at which saving and investment are exactly balanced, so that the price level of output as a whole exactly corresponds to $W_1$.

Thus the conditions for the equilibrium of the purchasing power of money require that the banking system should so regulate its rate of lending that the value of investment is equal to savings; for otherwise entrepreneurs will, under the influence of positive or negative profits, be both willing in themselves and at the same time influenced by the abundance or scarcity of the bank credit at their disposal, to increase or diminish (as the case may be) the average rate of remuneration $W_1$ which they offer to the factors of production.16

Finally, the fourth condition for the stability of the price level is concerned with the long-period or equilibrium norm of the purchasing power of money, and will be shown as $P = \Pi = W_1 = \frac{1}{e} W$.

Keynes divided price change into two components: profit inflation and income inflation. The former is a price change caused by profit ($Q_1, Q_2$, and $Q$), and is connected with the first three conditions, and the latter is a price change caused by changes in the cost of production $\left(\frac{E}{O}\right)$, and is connected with the fourth condition. But, as D. Patinkin17 pointed out, Keynes' distinction between profit and income inflations does not parallel the current distinction between demand and cost inflation.

Because Keynes' income inflation contains both a "spontaneous," and the exogeneous result of the increased demand for factors of production generated by the excess profits. D. Patinkin's opinion is not correct about his definition of income inflation not containing a spontaneous exogenous labour-union monopoly phenomenon.

Thus, the art of central banking in the Treatise not only has relationship to the money supply, but also to the four conditions for the stability of the price level.

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16 Keynes, J. M., ibid., p. 137.

17 Patinkin, D., Keynes' Monetary Thought, 1976.
Therefore the fundamental equations in the Treatise mean a criticism on the quantity theory of money, and the General Theory supported this criticism.

As regards the first condition (zero profits), windfall profits (and losses) have an important role in the Treatise, but normal profits play an important role in the General Theory. Keynes defined normal profit as that rate of profit which, if entrepreneurs were open to make new bargains with all the factors of production at the currently prevailing rates of earnings, would leave them under motive either to increase or to decrease their scale of operations. Windfall profits and losses are the difference between the actual profits and the normal profits.

As regards the second condition \( I=S \), it is well known that the fundamental equations in the Treatise are an instantaneous picture taken on the assumption of a given output, full employment income, while the General Theory assumes variable output, and underemployment income.

As the condition of \( I=S \) has no meaning, we must make a distinction between the actual saving \( S \) and the full employment saving \( S_F \). Therefore, \( I=S_F \) will become more important as a criterion of the art of central banking than \( I=S \). \( I>S_F \) gives rise to an inflationary gap, and the increase of prices, and the decrease of the value of money. On the contrary, \( I<S_F \) gives rise to a deflationary gap, and to the increase of unemployment, and the decrease of outputs. Since \( e_s=0 \) and \( e_p=1 \) are assumed in case of an inflationary gap, and \( e_s=1 \) and \( e_p=0 \) are assumed in the case of a deflationary gap, both sides are not symmetrical.

The third condition (natural rate of interest = market rate of interest) was rewritten as the equality between the marginal efficiency of capital and the market rate of interest. And, as regards the determination of the market rate of interest, liquidity preference theory were introduced. According to the theory, the rate of interest was determined by the demand and supply of money \( (L \) and \( M) \), separated from \( I \) and \( S \). This means that the determination of the rate of interest in the Treatise by the equalization of \( I \) and \( S \) was modified. But Keynes' opinion that the rate of interest will be determined only, by \( L \) and \( M \) seems to go too far. R. F. Harrod commented on this point.

Thus, Keynes' art of central banking must be considered in connection to the equality of investment and full employment saving. In this opinion, the art of central banking in connection with the money supply as in the quantity theory of money must be rejected. Therefore, Keynes' art of central banking is inconsistent with that of Friedman (X% rule).

V. The Radcliff Report and Keynes' Monetary Thought

With the expansion of the economy, the diversification of financial assets has given rise to their accumulation. This phenomenon poses us with the question of monetary policy. Money supply has been considered as one of the most important targets of monetary policy. By management of the money supply, the object of monetary policy like full employment and stability of prices can be attained. But the Radcliff Report proposed a new idea, i.e.

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18 Keynes, J. M., ibid., p. 112.
the management of general liquidity should be stressed instead of the money supply.

According to the Radcliff Report, the management of aggregate demand, which is the direct object of monetary policy. The first means is the effect of the rate of interest. This means is for the borrowers of capital funds, and it is based on the elasticity of investment to the rate of interest. But in the Radcliff Report, the general liquidity effect has been stressed too; this effects lenders of capital funds too.

Now, the Radcliff Report rejects a classic management of money supply that has been considered as the art of central banking. Instead of this the Radcliff Report proposed the management of general liquidity, and considered money supply as one of the general liquidity variables in the economy.

Of course the accumulation and diversification of financial assets appeared, and these financial assets seemed to be substitutes for each other. Therefore, monetary authorities should manage the general liquidity instead of the money supply.

But, according to the Radcliff Report, the management of general liquidity does not mean the direct management of liquidity as a whole. As long as the financial market is free and monetary authorities are able to conduct a discount policy, the monetary authorities can manage the general liquidity. Therefore, monetary authorities have to recognize that the structure of the rates of interest is the core of the financial assets structure rather than the money supply. Money supply is in second position only for monetary policy. Banks are considered as only one part of the liquidity structure, though they are the most powerful lenders. In other words, the Radcliff Report is interested in the lending behavior of banks, but not in the depositing behavior, i.e., banks as the money supply function are not stressed.

In short, the Radcliff Report insists that the primary object of monetary policy is not to effect the rate of interest, but the availability of credit.

Keynes' opinion seemed to be against the Radcliff Report, for Keynes insisted on the importance of money. In this sense, "Money matters" is Keynes' opinion as well as Friedman's opinion. But, the difference between them is in their recognition of the relationship between the money supply and monetary expenditure.

According to Friedman, a change in the money supply is the same as that in monetary expenditure. In contrast with Friedman, Keynes considered that the change of money supply is not always the size of the change of monetary expenditure, and that the change of effective demand necessarily is effected not only by the change of money supply, but also by a change in the opinion of entrepreneurs.

VI. The Comparison with the Art of Central Banking

by Friedman—$X \%$ Rule

The theoretical framework of Friedman is the synthesis of both classic currency principle and classic banking principle, like that of Keynes. But Friedman's specialities are found in the revival of the quantity theory of money that was rejected by Keynes.

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What is the fundamental difference between the classical quantity theory and the modern one? The former considered that $V$ was constant, but the latter considered that $V$ was considered as a function and its stability. Friedman considered Bonds, Equities, and Physical Goods as substitutes for holding money.

1. Bonds

$r_b$: coupon payment

$$\frac{1}{r_b} \frac{dr_b}{dt}$$: capital gains and losses

$$r_b - \frac{1}{r_b} \frac{dr_b}{dt}$$: total yield

2. Equities

$r_e$: a constant nominal amount

$$\frac{1}{P} \frac{dP}{dt}$$: the rate of inflation

$$\frac{1}{r_e} \frac{dr_e}{dt}$$: analogous to the capital gain adjustment on bonds

$$r_e + \frac{1}{P} \frac{dP}{dt} - \frac{1}{r_e} \frac{dr_e}{dt}$$: total yield

3. Physical Goods

$r_p$: real yield; constant

$$r_p + \frac{1}{P} \frac{dP}{dt}$$: nominal yield

We can consider $Y/r$ as the budget constraint, and $h$ as the ratio of non-human to human wealth, and $u$ as tastes and preferences.

Therefore we can get the demand for money function ($M^D$) as

$$M^D = f\left(P; r_b - \frac{1}{r_b} \frac{dr_b}{dt}; r_e + \frac{1}{P} \frac{dP}{dt} - \frac{1}{r_e} \frac{dr_e}{dt}; h; \frac{Y}{r}; u\right)$$

For simplicity, we can assume that $r$ (the general rate) was a weighted average of $r_b$ and $r_e$, and that

$$r_b = r_e + \frac{1}{P} \frac{dP}{dt}.$$

Thus, the simplified equation can be written as following.

$$M^D = f\left(P; r_b; r_e; \frac{1}{P} \frac{dP}{dt}; h; u; Y\right)$$

From above a difference is the low elasticity of substitution between money and physical goods by Keynes, and the high elasticity according to Friedman. Keynes divided the entrepreneurs (business class) and investors (investing class), but Friedman's portfolio selection seems to recognize that entrepreneurs' behaviour is like investors' one.

Friedman's formula of money supply control is the money supply with a fixed rate of increase.
$\dot{M}$: the rate of increase of money supply
$k$: the rate of increase of Marshallian $k$
$\dot{Y}$: the rate of growth of income.

$$M = kY$$
$$\dot{M} = k + \dot{Y}$$

The classic currency principle was based on metal money, i.e., gold coin, while the modern currency principle is based on credit money. Therefore the similarity between both is their stress on the money supply, whether metal money or credit money, but it is different on the investment and saving.

Thus, Friedman thinks that the economic system itself is apt to become balanced, through a flexible price mechanism, if there are no disturbances in the money supply, while Keynes thought that the economic system itself will become unbalanced, even if there are no disturbances in the money supply. Therefore, Keynes explained the art of central banking through the manipulation of investment and saving, through which Central Bank can preserve the stability of price level and prosperity of the economy.

Now, it is often said that we are all quantity theorists or Keynesians. There are differences and similarities: i.e., the difference is seen in the prescription of monetary policy as above, and the similarities in the theoretical framework, for example IS-LM analysis of the analysis of aggregate demand ($AD$) and aggregate supply ($AS$). To analyze the change of price level, it is necessary to use the $AD$-$AS$ analysis, because IS-LM analysis usually assumes stable price level.

Now, we can derive the $AD$ curve from $IS$ and $LM$. $IS$ can be written as following.

\[
Y = C \left( Y, \frac{A}{P} \right) + I(i)
\]

\[
0 < C_r < 1, \quad C_a > 0, \quad I_t > 0
\]

\[
Y: \text{ real income}
\]

\[
C: \text{ real consumption}
\]

\[
I: \text{ real investment}
\]

\[
A: \text{ nominal wealth}
\]

\[
P: \text{ general price level}
\]

\[
A/P (=a): \text{ real wealth}
\]

\[
i: \text{ the rate of interest}
\]

\[
M: \text{ nominal money balance}
\]

\[
L: \text{ real demand for money}
\]

$LM$ can be written as following.

\[
\frac{M}{P} = L(Y, i)
\]

\[
L_Y > 0, \quad L_i < 0
\]

Solving for the interest rate, we have

\[
i = i(Y, P; M)
\]

\[
i_Y > 0, \quad i_P > 0, \quad i_M < 0
\]

---


Substitute (4.3) into (4.1).

\[ Y = C \left( Y, \frac{A}{P} \right) + I[i(Y, P; M)] \] (4.1')

Thus, we get the aggregate demand function.

\[ Y^D = AD(P; M, A) \] (4.4)

where \( Y^D \): aggregate demand

\[ \frac{\partial Y^D}{\partial P} = -\left( C_a \frac{A}{P^2} - I_t + i_t \right) \left( 1 - C_Y - I_{\Delta Y} \right) > 0 \]

Therefore, we can draw \( AD \) curve sloping downward on \( Y-P \) dimension.

Next, we can get the \( AS \) curve sloping upwards on \( Y-P \) dimension. First, the relationship between wages and unemployment may be written as

\[ W = W_1 (1 - \epsilon u) \quad 0 < \epsilon < 1 \] (4.5)

where
- \( W \): nominal wage rate
- \( u \): unemployment rate
- \( \epsilon \): responsiveness of wage to unemployment
- \( -1 \): the previous period

Second, prices are assumed to be based on wages, with a markup ratio that allows for profits.

\[ P = bW \quad b > 1 \] (4.6)

The markup of prices over wages, \( b \), is constant.

Finally, with Okun's law, we can get the offering relation.

\[ u = h \frac{Y_f - Y}{Y_f} \quad h > 0 \] (4.7)

where \( Y_f \): full employment output.

We can thus obtain the aggregate supply curve (\( AS \)) from (4.5), (4.6), and (4.7).

\[ P = P_{-1} \left[ 1 - \epsilon h \left( 1 - \frac{Y^s}{Y_f} \right) \right] \] (4.8)

where \( Y^s \): aggregate supply

\[ \frac{\partial Y^s}{\partial P} = \frac{Y_f}{\epsilon h P_{-1}} > 0 \] (4.9)

Equation (4.8) is the short-run aggregate supply schedule.

The rate of inflation can be determined from (4.8).

\[ \frac{P - P_{-1}}{P_{-1}} = \epsilon h \left( \frac{Y^s}{Y_f} - 1 \right) \] (4.10)

This equation shows that the price level keeps changing unless \( Y^s = Y_f \), that is if output is above normal, the rate of inflation is positive, and conversely, if output is below normal.

We can get the inflation rate equation similarly from the Phillips curve that shows a relationship between unemployment and the rate of inflation as
The price level can be constant only at $u=0$, or $Y^s=Y_f$. Therefore, the long-run aggregate supply curve is vertical at the level of $Y_f$, with a given price level.

Now, let's imagine the inflationary case. The initial equilibrium point is $e$, and we can imagine two cases as inflationary case. (1) $e\to e'$ as the effect of $AD\to AD'$. (2) $e\to e''$ as the effect of $AS\to AS'$. Sometimes, it is said that Monetarists stress on (1) case, while Keynesians place stress on (2) case. But, this seems strange when considering that Keynes stressed the importance of effective demand. It seems important to consider IS-LM curves as well as $AD-AS$ curves for understanding the difference between Friedman theory and Keynesian theory.

Even in the case of $AD\to AD'$ that is equilibrium point $e\to e'$ in Fig. (a), both theories seem different, that is Friedman theory considers $LM\to LM'$, $i_0\to i_1'$, and $e\to e_1'$, while Keynesian theory considers two possibilities of (1) $LM\to LM'$, then $i_0\to i_1'$ and $e\to e_1'$, and (2) $IS\to IS'$ then $i_0\to i_1$ and $e\to e_1'$ in Fig. (b).

Therefore, we cannot ignore the importance of effective demand in the Keynesian theory.