Commodity Money, Say's Law, and Keynesian Economics

ARNOLD COLLEY*

Introduction

A central premise of Keynesian theory, the one above all others that distinguishes it from earlier theories, is that aggregate demand can be less than output. Although Malthus, Marx, and few other 19th century economists were modern in this sense, most classical writers considered such a situation impossible, even absurd. The principle by which the classics rejected the possibility of insufficient aggregate demand is now known as "Say's Law." This principle or law had several defenses. One was that no one would save without at the same time investing or lending to others who wished to invest; no one would ever desire to add part of his saving to money balances. Although

"Professor of Social Science, Ambrose College.

Support from the National Science Foundation through a grant to the Department of Economics, Massachusetts Institute of Technology, is gratefully acknowledged."

"(The doctrine that there can be a supply of commodities in the aggregate surpassing the demand appears to me to involve so much inconsistency in its conception, that I find considerable difficulty in giving any statement of it which shall be at once clear, consistent in its supports," John Stuart Mill, Principles of Political Economy (London: Longmans, Green and Co., Ltd., Ashley Edition, 1926), p. 557.

"There is not universal agreement that hoarding is essential to Keynesian economics. Mrs. Joan Robinson for one objects the notion that hoarding has anything to do with the possibility of a gap between aggregate supply and demand and refers to "The Banking Fallacy." The question of how wealth is held, whether in money or securities, has only the slightest connection with the interaction of investment and saving," Joan Robinson, Introduction to the Theory of Employment (New York: The Macmillan Company, 1937), p. 15. In a recent text with John E. Kawski, An Introduction to Modern Economics (Malden, Mass., McGraw-Hill, 1973a), a Keynesian-Kaleckian model is developed without money. They write "... it is this diverse between saving and investing, as between getting income and spending, which gives rise to instability in effective demand. This does not mean that the problem is somehow to be blamed on the monetary system. A private-enterprise economy could not operate without money in some form or other, at least as we see it, in private enterprise, not the money, which gives rise to instability," p. 97. Although Robinson and Keynes derive many of the propositions we associate with Keynes, their model, lacking money, is Blasian. It implies the propositions they attempt to refute. Those are two sectors, crops and machines. Both goods are produced with fixed proportions of labor and machines. Labor gets a fixed proportion of output, institutionally determined, paid in form. Capitalists are motivated by the desire to accumulate. Robinson and Kawski assert that investment determines the production of corn, but this simply would not be the case. No non-producing capitalist would fail to use his machines to the full; he always has the means to pay his workers, because they are paid a fraction of the output in the good produced. In their model: "Joan Robinson and John E. Kawski, 'Say's Law and an army of unemployed: Is there any case for Say's Law?" Economic Journal (London) 76 (1966), pp. 44, 47, and 67.

Although this point has been made often enough in the literature, it is neither widely known or accepted by the economics profession. Although Thomas Sowell, ibid, quotes extensively from John Stuart Mill, a commodity at all. Governments everywhere have taken over its management and replaced it with flat money, and commercial banking has further reduced flat money to a fraction of the total stock. Under modern circumstances a deficiency of aggregate demand is possible when, given a fixed stock of money, people wish to add to their money holdings.

No arrangement of resources by the private sector could eliminate the deficiency, since private firms are not permitted to supply that which is demanded. Although money is not now a commodity or ever likely again to be one, barring a catastrophic international crisis or adoption of one of the proposals for a world currency, an examination of the implications of its being a commodity can nonetheless be instructive. We gain not only a greater appreciation of the logic of the classical argument for the impossibility of an excess of commodities applicable to the case in which a circulatory medium is employed, but most likely we will reconsider a commodity. It must, undeniably, be admitted that there cannot be an excess of commodities, and an excess of money at the same time." John Stuart Mill, Essay on Some Unsettled Questions of Political Economy (London: John W. Fother, 1844), p. 71. Some more recent, post-Keyesian statements can be found in: Jacques Reffet, "The Fallacies of Lord Keynes's Classical Theory," Quarterly Journal of Economics, LXI (May 1947), pp. 343-47; Bob A. Balas, "John Stuart Mill and the Law of Markets," Quarterly Journal of Economics, LXIII (May 1949), pp. 264-70; "The Empirical Significance of the Real Balance Effect," Inquiry, 7 (1964), pp. 276-77; Arnold Zellner, National Income and Employment Analysis (New York: John Wiley & Sons, Inc., 1966, and 1970), Chapters I and II; Robert A. Mundell, Money and Economics (New York: McGraw-Hill Book Company, 1965), pp. 108-110.

of some parts of classical analysis, but in addition we understand modern monetary and income analysis better by having one more thing with which to compare and contrast it.

In this paper we shall present a familiar model that contains supply-and-demand functions for money and commodities and implicitly a supply-and-demand function for securities. It will contain one novel assumption: part of the output will be added to the stock of money. We shall be concerned with an economy that operates at full employment and one that operates with a rigid money wage and unemployment. In addition, we shall consider the case of complete mobility of capital between sectors and the case of complete capital immobility. What we achieve is a new analysis that introduces a special and historically interesting assumption about money into L-M and L-S analysis. In the last section of the paper we shall examine a model in which money wages are rigid and capital is immobile. We shall conclude that, even though Say's Law is true, the monetary and fiscal policy implications of Keynesian theory are unaffected. But we shall show that Keynes's analysis of the effect of wage reductions must be modified.

The Equations

For a closed economy in which money is a commodity, there exists the following relation:

\[ I_M = G_W + MW - SW + T_W, \]

where \( I_M \) is investment, \( G \) is government expenditures, \( M \) is the output of the money commodity, \( S \) is saving, and \( T \) is taxes. All variables are expressed in wage units, \( W \) being the symbol for the money wage rate.

With \( G_W \) and \( T_W \) exogenously determined, the three exogenous variables are: \( I_M, S_W, \) and \( M_W \). Saving varies with disposable income, \( Y_u \), minus \( T_w \), and investment varies inversely with the rate of interest, \( r \). We, therefore, have the following equilibrium condition, where \( Y_u \) is output in wage units:

\[ I_M + G_W + M_W = SW(Y_u - T_w) + T_W. \]  

(1)

\( I_M \) and \( SW(Y_u - T_w) \) are the investment and saving functions.

The demand for money in wage units, \( M_W \), a demand for a stock, depends on \( Y_u \) and \( r \). In equilibrium it must equal the supply of money, a multiple, \( p \), times all past production of the money commodity valued in wage units, \( (pW/W)M_u \), plus the current production of the money commodity in wage units, \( M_W \). \( pW \) is the price of the money commodity in terms of the unit of account, say the dollar; it is fixed by the government and will, therefore, be treated as a parameter.

\[ pW = \frac{pW}{W} M_u + \frac{p}{W} X + M_W. \]  

(2)

The physical quantity of the money commodity in existence at the beginning of the period. To simplify, we assume that the money commodity has no other use, so that a decrease in its value could not lead to its consumption. Setting demand equal to supply, we have

\[ M_W = \frac{K}{pW} pW X + M_W. \]  

(3)

The marginal products of labor and capital in producing the money commodity, the partial derivatives of Equation (5), equal the real wage and the real rent of capital, \( WRP \) and \( RDP \), where \( R \) is the rent of a unit of capital. Therefore, we have

\[ f(Y_u) = \frac{W}{RWP}. \]  

(4)

(5)

If there is no established unit of account, \( pW \) is equal to one. All prices are then relative prices.

The current output of the money good in wage units, \( M_W \), equals the value of output of the money good, \( pW \) times \( M \), divided by the wage rate, \( W \), where \( M \) is the quantity of the money good produced. Therefore,

\[ M_W = \frac{pW}{W} M. \]  

(6)

To avoid the necessity of dealing with relative prices, we assume that there are only two distinct goods produced, the money commodity and everything else. Government, consumption, and investment demands are, therefore, all satisfied by the same good. The quantity of that good produced is \( X \) and its price is \( p \). Total output is the sum of the output of the two goods:

\[ Y_u = \frac{pW}{W} X + \frac{pW}{W} M_u \]  

(7)

The output of each good is a linear-biogenous function of the quantities of labor and capital employed in its production. Letting \( \phi \) be the ratio of labor to capital and \( \phi \) the quantity of capital used to produce the money good, we have

\[ \frac{M}{X} = K \phi(Y_u). \]  

(8)

The product of labor and capital in producing the commodity, the partial derivative of Equation (5), equal the real wage and the real rent of capital, \( WRP \) and \( RDP \), where \( R \) is the rent of a unit of capital. Therefore, we have

\[ f(Y_u) = \frac{W}{RWP}. \]  

(9)

To avoid the necessity of dealing with relative prices, we assume that there are only two distinct goods produced, the money commodity and everything else. Government, consumption, and investment demands are, therefore, all satisfied by the same good. The quantity of that good produced is \( X \) and its price is \( p \). Total output is the sum of the output of the two goods:

\[ Y_u = \frac{pW}{W} X + \frac{pW}{W} M_u \]  

(10)

The output of each good is a linear-biogenous function of the quantities of labor and capital employed in its production. Letting \( \phi \) be the ratio of labor to capital and \( \phi \) the quantity of capital used to produce the money good, we have

\[ \frac{M}{X} = K \phi(Y_u). \]  

(11)

Full Employment with Mobile Capital

If the quantity of labor in use, \( L \), equals the total supply offered, Equations (1) through (11) describe a fully-employed economy. The eleven equations imply an equilibrium solution for eleven endogenous variables: \( W, P, X, M, K, S, R, G, Y_u \). The exogenous variables are: \( \dot{W}, G, T_w, T_{WP}, \dot{M}, K, L \). Without making further assumptions, it is not possible to reduce this system of eleven equations to two independent equations in two unknowns, for the demand and supply of money and the demand and supply of goods are independent. There is a special case in which things work out quite simply, however. Assume that the factor proportions are the same in both sectors: \( x \equiv SW \). If the factor proportions are the same then they must equal \( L/K \), both of which are known. Since \( pW \) is an exogenous
variable, the money wage rate is determined by Equation (6), once \( X_p \) is set equal to \( L/K \). Since \( X_p \) and \( W \) are known, Equation (9) determines \( P \), the price of the non-money good. In other words, with the price of money fixed by the government, the money wage rate and the price of the non-money good are determined directly from the production functions, in this special case of equal factor proportions.

What about \( Y_W \)? Since \( W/P \) and \( Y_W/P \) are determined from the production functions, \( Y_W \), as given by Equation (4), varies only with \( X \) and \( M \), the composition of output. With \( P=M/P \) given, the total differential of Equation (4) is \( dY_W = (P/W) \times dX + (P/X) dM \), which can be rewritten as \( [P^2/(W X)] \times dX + [P^2/(W M)] dM \). It is implicit in Equations (5) through (11) that \( dX/dM \) equals \( -P^2/X^2 \).

Therefore, \( dY_W \) is equal to zero, and \( Y_W \) is also determined from the production functions and is independent of the composition of output.

With \( Y_W \) and \( W \) determined from the production conditions, Equations (1) and (2) are sufficient to determine the rate of interest \( r \), and the output of the money good expressed in wage units, \( M_W \).

In Figure 1 the positively-sloped function, which is labeled goods-market equilibrium, is a graphic depiction of Equation (1). According to that equation, if \( r \) were to increase, investment would fall, and, given \( G_W \), \( Y_W \), and \( W \), equilibrium would necessitate an increase in \( M_W \); the function is, therefore, positively sloped. The negatively-sloped function, which is labeled money-market equilibrium, is a graphic depiction of Equation (2). According to that equation, if \( r \) were to rise, given \( G_W \), \( W \), and \( Y_W \), the demand for money would fall and equilibrium would require a reduction in the supply of money, \( M_W \), would decrease. The equilibrium values of \( r \) and \( M_W \) can be found at the intersection of the money-market and goods-market equilibrium lines.

An increase in \( G_W \) or a reduction in \( Y_W \) would cause the goods-market equilibrium line to shift to the left, raising the rate of interest and reducing the production of money. If, for example, \( G_W \) increased, given \( Y_W \) and \( W \) unchanged, either \( I_W \) or \( M_W \) would have to decrease. If \( r \) were to be unchanged, then \( M_W \) would be unchanged and the value of \( M_W \), corresponding to each value of \( r \), would be less; the function would shift to the left, raising \( r \) and lowering \( M_W \) in equilibrium. Since prices were determined without reference to Equations (1) and (2), they are independent of the composition of output and the rate of interest and would be unaffected by these fiscal actions.10

Consider now an increase in the money stock. The monetary authorities could create more money by raising \( g \), the ratio of the total money stock to commodity money. This change could be affected by open-market purchases of bonds, increasing discounted, or a lowered reserve requirement. An increase in \( g \) causes the money-market equilibrium curve to shift to the left. For \( W \) and \( Y_W \) given, the demand for money in wage units after an increase in \( g \) would be the same at each rate of interest as it was before. Therefore, at each rate of interest the real supply of money must be the same, which can only be so if \( M_W \) falls. So, corresponding to each rate of interest, \( M_W \) would be less. A shift of the money-market equilibrium line to the left in Figure 1 lowers the rate of interest and the production of money in wage units. Since the rate of interest would fall, it would be at least in part a monetary phenomenon. In spite of the change in the money stock and the production of money, prices would again be unaffected, since they depend only on production conditions, given the price of money itself unchanged; the quantity theory of money would have no applicability in this full-employment model for changes in the money stock brought about in the manner specified.

There is, however, another way the money supply could be increased: the price of money could be raised. An increase in the price of the money commodity, \( P^m \), would raise all prices in proportion, since with \( \phi_g \) given, Equation (6) implies that \( W \) is proportional to \( P^m \), and Equations (9) that \( P \) is proportional to \( W \). Since \( P^m/W \) and \( Y_W \) would be unchanged, the money-market and goods-market equilibrium lines would be unaffected by a change in \( P_m \) given \( g \) constant; the rate of interest and the composition of output would not depend on the price of money. Therefore, a change in the price of money with a proportional change in the nominal stock of money leaves the real stock of money unaffected in equilibrium. The quantity theory of money only holds then for increases in the money stock brought about by a change in its price.

The reader is again reminded that this analysis assumes identical factor proportions in the two sectors. If factor proportions differed, changes in demand would alter not only the composition of output, but factor returns and the price of the non-money good as well. An increase in \( g \), for example, causes \( M_W \) to fall. Resources would be reallocated away from the production of money to the production of investment goods. Now if factor proportions differed, the movement of resources between the two sectors could not occur without a change in the proportions. In the new equilibrium, real wages, whether measured in terms of the money commodity or the non-money commodity, would be greater if the non-money sector were relatively labor intensive and less if it were relatively capital intensive. \( P \), the price of the non-money good, would rise as more of it was produced. Changes in taxes and government spending would also alter real wages and the price of the non-money good.

Although we have assumed the supply of
labor to be given, one might prefer to assume that it varies with the real wage. In that case, changes in monetary or fiscal policy would alter employment when factor proportions differed. An increase in $G_{MW}$, for example, would cause resources to move out of the money sector and into the non-money sector, altering the real wage. If the supply of labor were positively related to the real wages, output and employment would rise if the non-money sector were relatively labor intensive and fall if relatively capital intensive.

Before considering the rigid-wage case, there is one more point worth making. Our analysis assumes the validity of the neo-classical theory of income distribution. For those who reject that theory, it may be useful to point out that essentially the same conclusions can be obtained without assuming anything explicitly about capital and income distribution. If we deflate money variables by the price of the non-money good rather than by the wage rate, we could consider the following system of five equations in five endogenous variables, where the fourth equation is a production-possibility function.

$$I_p(r) + G_p + \left(\frac{P}{P}\right) M = S_p(Y_p - T_p) + T_p$$

$$M_p(Y_p - r) = \left(\frac{P}{P}\right) M - S_p + \left(\frac{P}{P}\right)$$

$$Y_p = X + \left(\frac{P}{P}\right) M$$

$$X = f(M)$$

$$f(M) = \frac{P}{P}$$

Except for our remarks about real wages, all previous results could be obtained from this alternative model. If, for example, $f(M)$ were assumed constant, then the same results follow as in the case in which we assumed equal factor proportions.

Unemployment with Mobile Capital

By assuming that $W$ is a parameter and $L$ a variable, reversing their roles, the model of a fully-employed economy becomes one with unemployment. The system of eleven equations then implies an equilibrium solution for the following eleven endogenous variables: $r$, $M_{SW}$, $Y_W$, $P$, $M$, $L$, $K_{SW}$, $s_K$, $K$, $E$, and $L$. The exogenous variables are $G_{SW}$, $T_W$, $s_L$, and $W$. Since both $W$ and $P$ are exogenously determined, Equation (6) determines $s_K$, the factor proportions in the industry producing the money good. If we again begin by considering the special case in which factor proportions are the same in both sectors, then Equation (11) determines employment; employment is equal to the capital stock multiplied by the labor-capital ratio in both sectors as determined by $K_{SW}$. With $L$ known, Equations (5) through (11) again determine $Y_W$, which, therefore, is independent of the composition of demand. With $Y_W$ determined and $G_{SW}$, $T_W$, $W$, and $M_{SW}$ exogenous, Equations (1) and (2) again determine $r$ and $M_{SW}$. Therefore, the analysis we developed for the full-employment case, using Figure 1, applies equally well to this case of unemployment. An increase in government spending or a reduction in taxes alters the composition of output and changes the rate of interest, but has no effect on the other variables, including employment. Similarly, an increase in the money supply, brought about by the monetary authorities increasing $g$, would reduce the rate of interest and the production of money, replacing it with investment, but employment would be unchanged.

Although employment would be independent of $G_{SW}$, $T_W$, and $E$, there is a two-parameter case in which it would depend. They are $P$ and $W$. Even though no wealth effect on saving has been introduced into the analysis and even if the demand for money were infinitely elastic at the existing rate of interest, an increase in $P$ or a reduction in $W$ would raise the level of employment. Consider Equation (6). If $W/P$ fell, by either $W$ falling or $P$ rising, the marginal product of labor would fall. Since this could only occur if $s_K$ rose, with factor proportions the same in both sectors, we see from Equation (11) that $L$ would rise. A reduction in the money wage (or an increase in the established price of the money commodity) would expand employment, for a reduction in the money wage would entail a reduction in a "real" wage.

What if factor proportions differed? If factor proportions differed, then employment would depend on demand conditions, and shifts in the goods-market and money-market equilibrium curves would alter employment. A decrease in $T_W$ or an increase in either $G_{SW}$ or $g$ would lead to an expansion in the production of the non-money good and a higher rent on capital. The higher rent on capital would reduce the production of the money commodity, given its fixed price. $M_{SW}$ would fall. Resources would move out of the industry producing the money good and enter the other sector. Consider Equation (11). If $K_{SW}$ fell because of a reduction in the production of money and if the factor proportions were unequal, employment would increase if $s_K$ exceeded $s_L$ and would decrease if the reverse were true. With factor proportions initially unchanged, the money-good sector releases factors in the proportion in which it uses them. If it is less capital intensive than the non-money good, the absorption of the released capital in that industry would require more labor than the money industry has discharged; employment would increase. If the money industry releases more labor relative to capital than the non-money industry uses, the full employment of the capital stock would entail a reduction in the use of labor. Fiscal and monetary policy, therefore, might have the consequences expected of them, but the results could also be perverse.

Full Employment and Immobile Capital

In the short period it may be more plausible to assume that capital is immobile between sectors. Let us, therefore, assume that $K_M$ and $K_L$ are constant. We lose one variable, since $K_{SW}$ would now be exogenously determined, but we gain one variable, since there would be two different rents for capital, $K_{SW}$ and $K_L$, which need not be equal. Under these circumstances, $Y_W$ would depend on the composition of output. It would be impossible, therefore, to solve for any of the variables in the eleven equations without solving for the others. Certain generalizations can nonetheless be made.

Relative factor prices are determined in part by demand conditions. Changes in the goods and money markets would alter the composition of output and cause labor to move from one sector to the other. A reduction in $T_W$ or an increase in either $G_{SW}$ or $g$ would reduce the production of the money good and raise the production of the non-money good. The exit of labor from the money industry would raise the marginal product of labor; $W/P$ would rise. Since $P$ is unchanged, $W$ would rise. The higher wage rate on top of a higher rent for the scarce capital in the non-money sector implies an increase in $P$. Since the marginal product of labor would fall in the non-money sector, $P$ would rise more than $W$, and in this sense the real wage would fall. The changes in relative factor returns and the composition of output could alter $V_W$ and, through repercussions in the money and goods markets, moderate or reinforce the original disturbance.

Unemployment and Immobile Capital

Since $P$ and $W$ are both given in the unemployment case, we can find employment in the money sector directly from Equation (6), if $K_{SW}$ is also assumed given. With $s_K$ determined,
money-market equilibrium curve were horizontal at the existing rate of interest this might have no effect on \( Y_w \) and \( L \), but we have also to consider the goods-market equilibrium line. Consider Equation (1). An increase in \( M_w \), given \( r \), increases the left side of the equation. If equilibrium is to exist in the goods market, the right side must increase by the same amount; only an increase in income in inverse proportion to the marginal propensity to save would achieve this result. Therefore, corresponding to each rate of interest, \( Y_w \) would increase by the increase in \( M_w \) divided by the marginal propensity to save. A reduction in the money wage would, therefore, raise output and employment, as would an increase in the price of money. Notice that this result does not depend on a wealth effect on saving, for we have not assumed that the reduction in the wage rate decreases saving at each income level.

Keynes, in his *General Theory*, assumed explicitly that the production of gold was perfectly inelastic, and he therefore ignored the effect of wage reduction on \( M_w \). But even if Keynes's assumptions were granted, which I think few would grant, and the employment of labor and capital were unchangeable in the money sector, so that \( M \) were constant in the short run, a reduction in the wage rate would increase \( M_w \). In Keynes's analysis, therefore, flexible wages and unemployment equilibrium are incompatible even in the absence of a Pigou effect or even if the Pigou effect is transitory. Those who believe that a late-recovery economy may not offer full employment in equilibrium may be able to find support for this view in what Keynes said, but cannot find such support in Keynes's General Theory.

We shall end by considering a possible objection to this last point. Although the result is independent of the units in which output is measured, it might be thought sensitive to our assumption that the money good is not consumed. If the money good were also a consumption good, a reduction in wages with a proportional reduction in the price of the non-money good would raise the real income of the producers of the money good, but might lower perceived real income of others who consume the money good, since its relative price would have increased. If this were true, then an initial reduction in wages might have no effect on the output of the non-money good, because the increase in demand by one group would be offset by a reduction in demand by those who sensed a reduction in real income when the relative price of the money good increased. But if wages were flexible downward, they would continue to fall and the relative value of the money commodity would continue to increase. If the money good were a normal good—if the quantity consumed decreased as its value increased—a point would be reached at which the money good would become such a small part of consumption, eventually zero, that further increases in its relative value would make no one feel worse off.