Money and General Disequilibrium

Rajas Parchure
Gokhale Institute of Politics and Economics
Pune 411 004
Maharashtra, India

Abstract

This paper explores the existence of monetary general equilibrium in the context of a classical model of general equilibrium theory based on the static open Leontief model. It begins by constructing the model of an ideal economy in which money is inessential. This model is the counterpart of the Arrow-Hahn model that has no place for money. It then proceeds to articulate a more realistic model of a barter economy in which money plays an essential role in reducing transaction costs and materially improving the real economic outcomes in terms of outputs and real income. The conditions under which a full employment general equilibrium obtains in the regimes of currency and credit money have been established. General disequilibrium is shown to prevail if parts of the proceeds or income generated from currently produced outputs are devoted to accumulating money balances, so that saving exceeds investment. Fiscal solutions for restoring full employment general equilibrium have also been demonstrated and reasons for the inefficacy of policies like quantitative easing have been articulated.

Key Words: Money, General Equilibrium, Unemployment Equilibrium, Fiscal Policy

JEL Classification Numbers: E12, E13, E24, E63

I Introductory

Modern discussions of money in general equilibrium theory have their origins in the controversies about Keynes’ (1936) thesis that monetary economies do not possess automatic inbuilt mechanisms to clear all markets including the labour market and, consequently, that the government will need to intervene by means of an expansionary fiscal policy to ensure full employment. Pigou (1943) and later Patinkin (1965) were of the opinion that Keynes’ thesis was not theoretically sustainable because he neglected the operation of the real balance effect which would serve as an automatic stabiliser of aggregate demand in the event of deflation and bring it in line with aggregate supply. However, investigations by Clower (1965) and Hahn (1965) revealed that, in Patinkin’s model, money and goods were indistinguishable from one another so that “goods were allowed to buy other goods”. Further investigations by Hahn (1965) and Arrow and Hahn (1972), which attempted to give a satisfactory treatment of money in which “the excess demand functions were not invariant to the distribution of money endowment” came up with the completely nugatory conclusion
that modern general equilibrium theory has no place for money, that money has no essential role to play in that theory. Ostroy (1973) summed up the dilemma of integrating monetary and value theories by asking, “How to make money appear without making standard theory disappear?” and Hahn (1973) concluded that, “There is nothing we can say about the equilibrium of an economy with ‘money’ that one cannot say about the equilibrium of a non-monetary economy”. About a decade later Hahn (1982) noted that, “The most serious challenge that the existence of money poses to the theorist is this: the best developed model of the economy cannot find room for it”.

During the last three decades, the chief concern of monetary general equilibrium theory has been directed towards finding substantive reasons for the existence of an “essential” money and demonstrating the conditions under which general equilibrium can prevail in the presence of that money. A large variety of strategies have been brought to bear on this question which nevertheless have one feature in common, viz. all of them alter the initial assumptions of general equilibrium theory itself to make room for a medium of exchange which has a positive exchange value even though it is by itself worthless. This has meant introducing constraints, restrictions, frictions, imperfections, inefficiencies, uncertainties, non-convexities, etc. into the general equilibrium model. Some of the ‘successful’ strategies have been the cash-in-advance constraint [Clower, (1967), Shapley and Shubik (1971), Sargent (1987)] infinite agent infinite horizon models [Bewley (1980), Gale and Hellwig (1984)], overlapping generations models [Brock 1974, Wallace 2001], sequence economies [Hahn (1971), (1973), Lucas and Stokey (1987)], credit verification costs [Woodford, 1986], search and random matching models [Trejo and Wright, 1995], positive bid-ask spreads [Duffie, 1990], separate budget constraints for individual transactions [Starr, 2002], incomplete markets [Magill and Quinzi (1992), Cass (2006)], uncertainty [Bewley (1980)], utility of holding money [Brock (1974)], acceptability of money in payment of taxes [Starrett (1973)], restriction that Pareto-optimal allocations require trade [Duffie, 1990], etc. Reviewing these developments Gale (2010) in his entry on “money and general equilibrium” in The New Palgrave quoted Ostroy’s (1987) conclusion that,

“We shall argue that the incorporation of monetary exchange tests the limits of general equilibrium theory…….” and himself concluded, “That comment is just as true today as it was then and remains a great challenge for economists who want to develop more satisfactory models of the process of monetary exchange at the level of the economy as a whole”.

While these developments have proceeded apace the original Keynesian concerns which were the cause of these developments, “Does the working of a monetary economy differ in a fundamental way from the working of a real economy?” “Is the use of money compatible with the existence of a full employment general equilibrium?” “Is money neutral?”, etc. seem to have faded into the background at least in the literature on money in the context of general equilibrium theory. The question of the essentiality of money has occupied far more attention in this literature than the question of the neutrality of money.
This paper addresses the questions of both essentiality and neutrality of money from the standpoint of a classical model of general equilibrium. In parallel with the neoclassical literature, it attempts to find a minimal set of conditions that can account for the existence of essential money. It then proceeds to investigate the conditions in which money, though essential, is also non-neutral. The paper is divided into six sections. The second section articulates a classical model of general equilibrium of a barter economy that has no place for essential money. This model may be regarded as the classical counterpart of the Arrow-Hahn (1972) moneyless neoclassical model. The conditions for the existence of essential money have been investigated in a “less-than-ideal” model of a barter economy in the third section. The fourth and fifth sections deal with currency money and credit money respectively. In these sections, the conditions under which general disequilibrium can arise and the policy actions by which the disequilibrium can be corrected have been investigated. It is shown that the disequilibrium persists in spite of the operation of Walras’ law and the quantity theory of money; their operation does not provide automatic inbuilt mechanisms to restore equilibrium. The sixth section contains a brief doctrinal discussion and some concluding remarks.

II General Equilibrium: Ideal Barter Economy

The production side of the classical model will be described by a static open Leontief model that produces gross outputs that are just sufficient to meet the replacement requirements of all industries and the final consumption demands of the workers’ households\(^2\). Net saving and net investment are zero. Final consumption demands are described by fixed share Engels’ coefficients, these being the simplest possible representation of consumer demand as homogenous of degree zero functions of income and prices. (Money illusion is absent.) None of the conclusions of the paper are materially affected if use is made of the theoretically more general and empirically more satisfactory demand systems such as the Linear Expenditure System or the Almost Ideal Demand System\(^3\). It can be shown that this economic system has a unique positive equilibrium at full employment. The price system is,

\[
PA + wL = P \quad \cdots(1)
\]

Where \(A\) is the matrix of I-O coefficient satisfying the conditions for economic viability, \(L\) and \(P\) are row vectors of labour coefficients and prices and \(w\) is the wage rate. One of the prices can be set as a numeraire and a unique positive solution of the relative prices and the real wage rate can be found from equation (1). Let \(L^*\) be the total quantity of labour supplied at the real wage rate determined in the price system. If \(L^*\) is employed, the real net national income is \(Y = wL^*\). Accordingly, the quantities demanded for final consumption of the \(n\) goods will be

\[
C_i = \frac{\alpha_i wL^*}{p_i} \quad \sum \alpha_i = 1 \quad \cdots(2)
\]

The gross outputs required to satisfy these final consumption demands are obtained as

\[
X = (I - A)^{-1}C \quad \cdots(3)
\]
where $X$ and $C$ are column vectors. The markets for the goods are cleared. It remains to be shown that the solution $(P,w,X)$ must be such as to ensure full employment. This is easily done. The quantity of labour required to produce the output vector $X$ is

$$LX = L(I - A)^{-1}C$$

From (1) we know $P = wL(I-A)^{-1}$ so that

$$wLX = wL(I-A)^{-1}C = PC = \sum_{i} \frac{p_i \xi_i w L^*}{p_i} = wL^*$$

and $LX = L^*$

implying that the demand for labour required to produce gross output $X$ equals the labour supplied $L^*$. In effect, there are $n$ price equations and $n$ output equations in (1) and (3) that determine $2n$ variables; $n-1$ relative prices, 1 real wage rate and $n$ outputs. The solution of (1), (2), and (3) is a full employment market clearing equilibrium.

There is no place whatsoever for money to exist in this economic system. All the commodities and labour are costlessly exchanged for one another. Every agent, whether the $F$ firms working in $N$ industries or the $H$ households that supply labour, transact in all commodities without any cost. A quantity theory equation of the type

$$M_d = \sum m_i p_i X_i + m_H wL^* = M^*$$

where $m_i$, $m_H$ are proportions of industry sales and household incomes and $M^*$ is the supply of money, can be added to determine $n$ money prices, 1 money wage rate and $n$ outputs, but the solution does not differ in any way from that obtained from (1), (2) and (3). Money is not held by anybody – it does not appear either in price equations of the industries nor in the demand equations of the households. The strict classical dichotomy of real and monetary sectors prevails. The existence of money makes no difference whatsoever; it is as if money does not exist. The absence of transaction costs implies the absence of money whose essentiality derives from its ability to reduce transaction costs. Besides being completely inessential money is also completely neutral. As Sraffa (1932, p. 42) put it,

"......... a state of things in which money is "neutral" is identical with a state of things in which there is no money at all ......."

III Why Money?

The idealized barter economy operates a transactions technology that is so efficient that there is no need for a less efficient device like money (we can only fondly hope that we will someday live in the idealized economy). What is needed to explain the emergence of essential money is a less than the ideal world of (1), (2) and (3). Therefore, the harsh features of the wretched economic life that agents lead in an actual barter economy must be reflected in the model of the economy if the essentiality of money is to be brought into sharp focus. After all, money is a technoinstitutional arrangement that is designed to reduce the costs of making transactions
and, therefore, must consist of (a) a commodity (or commodities) having a peculiar set of properties, viz. durability, divisibility, portability, etc. that enable its use to reduce transactions costs and (b) of monetary institutions that administer monetary payments. So let us first visualize a barter economy in which the commodities themselves are used to perform the monetary function. In the absence of double coincidence of wants, every agent would be required, in general, to hold a stock of each of the goods $S_k (k=1-...-F+H)$ separately, as it were, only for the purposes of making transactions. Let the annual costs of storage, security, transport, deterioration, decay, damage, pilferage, theft and wastage associated with the holding of each commodity stock for transaction purposes be $t_{ik} (k=1-...-F+H)$ in terms of the commodity itself. Then the sum $\sum t_{ih}S_{ik}$ for firms $k$ belonging to industry $j$ when divided by industry $j$’s output will be a coefficient $t_{ij}$ that represents the annual cost of carrying stock $i$ in industry $j$ for transactions purposes. The gross I-O coefficient matrix for the barter economy will be

$$A_B = A + T = a_{ij} + t_{ij}, \quad ij=1...n$$

The net (disposable) wage income of the households who, too, carry transaction stocks and incur the associated costs will stand reduced to

$$w_N L^* = wL^* - \sum_i \sum_h t_{ih}S_{ih}p_i \quad h=1...H$$

Thus, a more realistic description of the barter economy than (1), (2), (3) is obtained as follows,

$$P_B = P_B A_B + wL \quad \cdots (1)'$$

$$C_{iB} = \frac{\alpha_i w_N L^*}{P_{iB}} \quad \sum \alpha_i = 1 \quad \cdots (2)'$$

$$X_B = (I-A_B)^{-1} C_B \quad \cdots (3)'$$

This system too will give a unique positive equilibrium if $I-A_B$ fulfils the viability conditions but it will be one which results in higher prices, lower outputs and lower real net income than the system (1), (2), (3); because $A_B > A$ and $w_N < w$ implies $P_B/w > P/w$, $C_B < C$ and $X_B < X$.

If one commodity (or a small set of commodities) exists for which the transactions cost is lowest $t_{mk} < t_{ik} (i\neq m)$ then the number of commodity stocks required to be held for transactions throughout the economy would reduce from $N (F+H)$ to $F + H$, a drastic reduction from a power of 2 to a power of 1 and this commodity could serve as the medium of exchange. Thus, the condition for the existence of an essential commodity money can be stated as follows,

$$\sum t_{mk}p_m < \sum \sum t_{ik}p_i \quad k=1,...,F+H$$

In the single commodity money economy, the I-O matrix will be $A_M = A + column (t_{m})$ and $w_N L^* = wL^* - \sum t_{mp}p_m$. If we reasonably suppose that $A_B > A_M > A$ then we get $C_B < C_M < C$, $P_B/w > P_M/w > P/w$ and $X_B < X_M < X$; the single commodity money
economy is more efficient than the realistic barter economy (1)', (2)' and (3)', but less efficient than the ideal barter economy (1), (2), (3) for which \( t_k = 0 \).

The efficiency of the commodity money economy in which, say, gold (in the form of coins containing a certified quantity and quality of the metal) serves as money, can be further improved. The \( F+H \) decentralised hoards that are required to be held for transaction purposes can be centralized into a single hoard in a bank to achieve further economy in the expenses towards storage, security and transport. But, even that is not quite efficient because each agent would have to make say two trips to the bank each day, one to withdraw gold at the start of the day for making purchases during the day and another one at the end of the day to deposit his collections, i.e. a total of \( 2(F+H) \) trips, which would entail transport and in-transit security expenses. If the bank issues bearer currency notes against the gold deposits (and undertakes to convert them when required), these expenses are further economized. Even this can be improved upon by issuing cheque books, installing ATM’s and by e-banking. At the same time, the costs of inter-regional payments can be economized/reduced/minimized/optimised by individual banks centralizing their hoards into a single central bank which can issue notes of a uniform quality and set up clearing facilities. At this point, the monetary technology attains such a high level of efficiency that people do not mind even if government nationalizes the central bank to appropriate its gold reserves, suspends the convertibility of currency notes into gold and itself issues notes and enjoys the benefits of seigniorage. It is this monetary system whose behaviour is the principal concern of monetary economics.

IV Currency Money

We shall suppose at this stage that banks only administer the system of payments in currency notes (credit money will be the subject of the next section). In performing their functions, banks will incur expenses which they recover by charging a fee per dollar of deposit for services of accounting, safekeeping, withdrawals of cash over the counter or by ATM, issue of cheque books, clearing services, replacement of worn-out notes, etc. The introduction of this non-commodity money into the price system needs to be carefully done. Money is used for production of goods but no part of it is ever used up in the process of production. As Adam Smith taught us a long time ago, “Money is a branch of the general stock of society” but is peculiar in that, “it is neither a material to work upon nor a tool to work with”. [Smith (1976), Book II, Chapter II]. Thus, only the direct cost associated with holding and using monetary stocks can enter the price equations. The price equations for the economy are as follows,

\[
p_c m_i p_i X_i + \sum A_{ji} p_j + wL_i = p_i X_i \quad \ldots(5)
\]

\[
\sum A_{jc} p_j + wL_c = p_c M^* \quad \ldots(6)
\]

\[
\sum m_i p_i X_i + m_H wL^* = M^* \quad \ldots(7)
\]

In other words, the matrix of I-O coefficients in the price system should now be read as \( Ac = A + \text{diag} (p,m) \) and it should be presumed that \( t_k=0 \) (notes and deposits entail negligible or even no physical wastages), \( p,m \ll m_p \) for each industry i and
where \( p_c \) is the bank fee per dollar of deposit. Equations (5), (6) require, respectively, that the sales revenues of industries and banks must cover their costs and equation (7) requires that the market for money be cleared. The total labour is now \( L^* = \sum L_i + L_c \). As regards the demand equations for the goods, three specifications suggest themselves. The first is to net out bank service charges from the gross income from wages and then apply Engels’ coefficients to their net income. Then, the final demands and the gross outputs required to satisfy the final demand are,

\[
F_i = \frac{\alpha_i (wL^* - p_c m_{HM}wL^*)}{p_i} + A_{ic} \quad \sum \alpha_i = 1
\]

\[
X = (I - A)^{-1} F
\]

It should be noted that the cost coefficients of banking services appear in the price equations but will not appear in the output equations 8(b). Of course, the effect of bank service charges that households pay and which lower their net income and their final consumption demand will affect the solution of \( X \) in 8(b). Also, the price equations (5) become non-linear since both unknowns, \( p_c \) and \( p_i \), appear as a product. But this does not pose a problem because an iterative solution is always possible. The system of equations (5) to (8) gives an equilibrium solution for \( n \) money prices of commodities, \( n \) outputs, \( p_c \) the bank fee and \( w \) the money wage rate provided the terms \( p_c m_{ik} \) appearing on the main diagonal of the price system are low enough to ensure overall economic viability. Letting \( d = \text{diag} (p_c m_{ik}) \), the price equations in (5) may be written in matrix notation as

\[
P [A + d] + wL = P
\]

\[
wL = P (I - A - d)
\]

Multiplying both sides by the market clearing gross output vector from 8(b) gives

\[
wLX = P [I - A - d] (I - A)^{−1} F
\]

\[
= PF - PdX
\]

From 8(a) we know that

\[
PF = wL^* - p_c m_{HM}wL^* + PE_c
\]

where \( E_c \) is the vector containing \( A_{ic} \). Multiplying (7) by \( p_c \) on both sides and substituting for the second term on the right hand side, gives \( p_c M_v^* - p_c \sum m_{ip}X_i = p_c M_v^* - PdX \). Further, from equation (6) we know that \( p_c M_v^* = PE_c + wL_c \) so that

\[
PF = wL^* - wL_c + PdX.
\]

Hence, in view of equation (9) we must have

\[
wLX = wL^* - wL_c
\]
i.e., \( LX + L_c = L^* \)

In short, a full employment market clearing equilibrium with positive prices and outputs exists. There are \( 2n + 2 \) linearly independent equations \([n \) price equations in (5), a bank fee equation (6), 1 quantity theory equation (7), \( n \) and output equations 8(b)] to determine \( n \) money prices, 1 money wage, 1 bank fee and \( n \) commodity outputs.

It is obvious that the monetary general equilibrium obtained from equations 5, 6, 7, 8 is completely different from that obtained from equations 1, 2, 3 and 1′, 2′, 3′. Observe also that the price and output systems are not exactly duals of one another as they were in equations (1) to (3) and (1)′ to (3)′. Indeed, it can be said that the exact duality of the price and output systems is a key feature of barter economies whether ideal or less-than-ideal; monetary economies are distinguished by the fact that their price and output systems are not exact duals of one another. For the currency economy under discussion, the matrix to determine the outputs is \( A \) but the matrix to determine prices is \( A + d \). The costs of using money and/or monetary institutions are loaded into the cost-price system but they do not appear in the output system as they do in the case of the barter economies of section 3. It means that the use of the monetary technology for transactions has enabled the economic system to operate its production technology at full efficiency. We may now suppose that \( A_B > A_m > A_c = A \) so that \( X_B < X_m < X_c < X, \ C_B > C_m > C_c > C \) and \( \frac{p_B}{w} > \frac{p_m}{w} > \frac{p_c}{w} > \frac{p}{w} \). The currency money economy delivers greater outputs than the barter economy and the single commodity monetary economy at lower real prices. Neo-Walrasian theory fails to capture these great advantages of monetary exchange over barter because it lacks the framework of cost-based prices and production-based incomes. In the ‘welfare’ sense the full employment equilibrium with currency money dominates the rather dreadful one that obtains under the barter system described by (1)′, (2)′ (3)′. This conclusion stands in sharp contradiction to neo-Walrasian findings that the introduction of essential money having positive exchange value results in allocations that are not generally Pareto efficient. [See Starr (2010)]. That conclusion is sustainable only if a comparison is made between a system with essential currency money (which entails transaction costs) with the ideal barter equilibrium of (1), (2), (3) in which transaction costs are entirely absent. But then the conclusion is obvious enough to be superfluous.

A second way to specify the consumer demand equations is to suppose that consumers make the bank service itself an object of conscious consumer choice, that is to say

\[
F_i = \frac{\alpha_i wL^*}{p_i} + A_iC \quad i=1\ldots n, c \quad \sum \alpha_i = 1 \quad \ldots(8c)
\]

This does not in general give an equilibrium solution except in the special case \( \alpha_c = \frac{p_c m_H}{w} \).

The third specification that presents itself for consideration is to make currency balance itself an object of conscious consumer choice,

\[
i.e., \alpha_i (wL^* - p_c m_H wL^*) = \Delta C, \quad \sum \alpha_i + \alpha_c = 1 \quad \ldots(8d)
\]
This requires some justification considering that households are already holding balances of \( m_H L^* \) for performing transactions. Therefore, the additional balances demanded out of net income must be justified on “precautionary” or “speculative” grounds\(^{(6)}\). So far as a static economy is concerned, it must be supposed that the grounds are provided by something external, say, the prospect of a war, political and industrial unrest, a drought, etc. because internal sources of potential risk such as stock, bond or real estate market collapses are supposed to be absent. Whatever the reason, if it happens that a fraction of the net income is devoted to an addition to currency balances, there is bound to be disequilibrium. At least one of the markets for the commodities or for labour will fail to clear.

Consider the following numerical example that in turn illustrates monetary general equilibrium and disequilibrium in turn:

\[
A = \begin{pmatrix}
0.05 & 0.1 & 0.1 & 0.15 \\
0.25 & 0.30 & 0.15 & 0.25 \\
0.2 & 0.25 & 0 & 0.15 \\
0.1 & 0.05 & 0.075 & 0.1
\end{pmatrix} \quad L = (0.5, 2, 1, 4) \\
\begin{pmatrix}
m_I = (0.05, 0.01, 0.025, 0.04) \\
m_H = 0.3
\end{pmatrix}
\]

\[
A_{ic} = (0.5, 0.1, 0.15, 0.25) \quad L_c = 5
\]

\[
L^* = 100 \quad M^* = 100 \quad \alpha_i = 0.25 (i=1…4)
\]

If consumer demand is specified as per equation 8(a), then the equilibrium solution for equations 5 to 8(b) is shown in Table No. 1. All value magnitudes like the capital stock, the national income, the wage bill, etc. are determined only after the equilibrium prices, outputs and the wage rate have been determined – none of them have been supposed to be given exogenously. In Table 1, the last column contains the value magnitudes, \( K = p_c \sum m_i p_i x_i + \sum \Sigma A_{ji} p_j + wL^* \) being the capital stock employed (in the classical sense) in the economy, \( Y \) the net national product and, \( V_G \) and \( V_y \) the transactions and income velocities of money. The national income identity can be verified by adding equations (5) and (6) and substituting for \( M \) from equation (7) to give

\[
wL^* = \sum p_i x_i - \sum \Sigma A_{ji} p_j - \sum A_{jc} p_j - p_c m_H wL^*
\]

The national product at market prices includes the value of bank services supplied to households (the value of those supplied to industries is netted out) and the net national product at factor cost equals the net national product at market prices. However, the disposable income available to consumers is \( wL^* - p_c m_H wL^* \). Table 1 presents the equilibrium solution. The labour market is also cleared because \( LX + L_c = L^* = 100 \).
Table 1:

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Outputs</th>
<th>Real wage rate w/p</th>
<th>K=634.7878</th>
</tr>
</thead>
<tbody>
<tr>
<td>p₁</td>
<td>8.3898</td>
<td>13.6759</td>
<td>0.3283</td>
<td></td>
</tr>
<tr>
<td>p₂</td>
<td>12.9347</td>
<td>18.8187</td>
<td>0.2129</td>
<td>LX+ L_c=L' =100</td>
</tr>
<tr>
<td>p₃</td>
<td>6.9724</td>
<td>17.9489</td>
<td>0.3950</td>
<td>Y=wl' =275.46</td>
</tr>
<tr>
<td>p₄</td>
<td>18.6025</td>
<td>8.1439</td>
<td>0.1480</td>
<td>p_mnwl'=20.6255</td>
</tr>
<tr>
<td>p₅</td>
<td>0.2495</td>
<td>--</td>
<td>--</td>
<td>V_c = 6.348</td>
</tr>
<tr>
<td>w</td>
<td>2.7546</td>
<td>--</td>
<td>--</td>
<td>V_c = 2.751</td>
</tr>
</tbody>
</table>

Table 2:

<table>
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<th></th>
<th>Price</th>
<th>Output</th>
<th>Real wage rate w/p</th>
<th>K=529.4794</th>
</tr>
</thead>
<tbody>
<tr>
<td>p₁</td>
<td>8.6876</td>
<td>11.0482</td>
<td>0.3280</td>
<td></td>
</tr>
<tr>
<td>p₂</td>
<td>13.3869</td>
<td>15.1403</td>
<td>0.2129</td>
<td>LX+ L_c = 81.5498 = Demand for labour &lt; 100 = L'</td>
</tr>
<tr>
<td>p₃</td>
<td>7.2178</td>
<td>14.4174</td>
<td>0.3948</td>
<td>Y=232.414</td>
</tr>
<tr>
<td>p₄</td>
<td>19.2576</td>
<td>6.5819</td>
<td>0.1480</td>
<td>p_mnwl'=20.6255</td>
</tr>
<tr>
<td>p₅</td>
<td>0.2583</td>
<td>--</td>
<td>--</td>
<td>V_c = 5.2947</td>
</tr>
<tr>
<td>w</td>
<td>2.8500</td>
<td>--</td>
<td>--</td>
<td>V_c = 2.324</td>
</tr>
</tbody>
</table>

If however, demand is as specified in 8(c), in which a fraction of net household income is devoted to holding additional money balances, for instance a_i=0.2 (i=1….4) and α_c=0.2, the disequilibrium solution obtained is shown in Table 2. The velocities of money with respect to the gross and net products show a steep decline, the commodity markets are cleared but there is an excess supply of labour. The resulting deflationary gap measured in terms of labour is 100-81.5498=18.4502 and in value terms it is $2.85 x 18.4502=$52.5830. Walras' Law holds good; the excess demand for money balances αₖ (wL* − p_c m_H wL*), which is (0.2)(2.85)(100)(1-(0.2583)(0.3)), exactly equals the value of the excess supply of labour w(L* − L) which is (2.85) (100-81.5498). If, on the other hand, we force employment to remain at 100 across industries then there would be an excess supply of one or all of the commodities. It is obviously more reasonable to suppose that the commodity markets are cleared and the labour market fails to clear for the simple reason that suppliers of the commodities would like to cut down their losses and maintain a breakeven by supplying only as much as is demanded, a mechanism that is inapplicable to the labour market. The deflationary gap qualifies to be called an unemployment equilibrium in the sense that all commodity markets are cleared in the presence of unemployment. As Keynes (1936) put it,

"Unemployment develops, that is to say, because people want the moon; men cannot be employed when the object of desire (i.e. money) is something which cannot be produced and the demand for which cannot be readily choked off."

[Chapter 17 p.235]

Keynes also supplied the reason for his conclusion,

"......... money has, both in the long and the short period, a zero, or at any rate a very small, elasticity of production .......... Money, that is to say, cannot be readily produced; - labour cannot be turned at will by entrepreneurs to produce money in increasing quantities as its price
rises in terms of the wage unit. In the case of inconvertible managed currency, this condition is strictly satisfied”.

[Chapter 17 p. 230]

The only way in which the disequilibrium can be removed would be for the government to finance a deficit and purchase commodities and/or labour by printing notes. As an example, suppose government decides to buy commodities from the four industries. Then government purchases of $G_i=1.0867$ units of each of the four commodities [these are added to the final demand vector $F$ in equation 8(c)] entailing an expenditure of $\sum p_i G_i = $51.0325 brings about the full employment equilibrium shown in Table 3.

Table 3:

<table>
<thead>
<tr>
<th>Price</th>
<th>Output</th>
<th>Real wage rate $w/p_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p_1$</td>
<td>8.4009</td>
<td>13.1737</td>
</tr>
<tr>
<td>$p_2$</td>
<td>12.9511</td>
<td>18.7212</td>
</tr>
<tr>
<td>$p_3$</td>
<td>6.9816</td>
<td>17.1298</td>
</tr>
<tr>
<td>$p_4$</td>
<td>18.6271</td>
<td>8.4604</td>
</tr>
<tr>
<td>$p_c$</td>
<td>0.2499</td>
<td>--</td>
</tr>
<tr>
<td>$w$</td>
<td>2.7582</td>
<td>--</td>
</tr>
</tbody>
</table>

It may be observed that the physical multipliers (i.e. increments in industrial outputs due to additional final demand of 1.0867 units due to government purchases) are all greater than 1. The velocities of money are restored to levels very close to those shown in Table 1.

Several alternative mixes of deficit spending may be employed to remove the deflationary gap. For example the government might choose to concentrate the deficit spending on say commodity 1. In that case, the purchase of $G_1 = 6.085$ units requiring deficit spending of $50.2590$ would restore overall equilibrium as is shown in Table 4. Or, the government can simply offer employment to “dig holes and fill them up” and eliminate the deflationary gap.

Table 4:

<table>
<thead>
<tr>
<th>Price</th>
<th>Output</th>
<th>Real wage rate $w/p_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p_1$</td>
<td>8.2594</td>
<td>18.3372</td>
</tr>
<tr>
<td>$p_2$</td>
<td>12.7358</td>
<td>18.7669</td>
</tr>
<tr>
<td>$p_3$</td>
<td>6.8650</td>
<td>17.0034</td>
</tr>
<tr>
<td>$p_4$</td>
<td>18.3158</td>
<td>7.8236</td>
</tr>
<tr>
<td>$p_c$</td>
<td>0.2457</td>
<td>--</td>
</tr>
<tr>
<td>$w$</td>
<td>2.7128</td>
<td>--</td>
</tr>
</tbody>
</table>

There is very little point in arguing that the hoarding of cash out of receipts or incomes earned from currently produced outputs amounts to “irrational” behaviour and, for that reason, will never occur. For if this, as a matter of fact, is what people actually do under certain circumstances, then all that remains to be done is to investigate the reasons for such behaviour and its consequences for the behaviour of the economic system.
V Credit Money

In the course of administering the payments mechanism of the society, banks discover that the net withdrawals during a period are only a fraction of the total moneys in deposit with them so that, if banks can hold a fraction \( q \) of the deposits as reserves to meet the periodic withdrawals, they can lend the remaining amounts as loans and earn interest income. The balance sheet of the banks is shown in Table 5.

Table 5: Banks’ Balance Sheet

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Deposits ( M_i )</td>
<td>( qM ) Reserves</td>
</tr>
<tr>
<td>Household Deposits ( M_H )</td>
<td>((1-q)M) Advances</td>
</tr>
<tr>
<td>Total Liabilities ( M_i + M_H = M^* )</td>
<td>Total Assets ( M^* )</td>
</tr>
</tbody>
</table>

As before \( M_i = \sum m_ip_iX_i \) and \( M_H = m_HwL^* \). If we suppose that only firms take loans the price equations of the economy are

\[
\delta k (m_ip_iX_i + \sum A_{ji}p_j + wL_i) + \sum A_{ji}p_j + wL_i = p_iX_i \quad \ldots (9)
\]

\[
\sum A_{ji}p_j + wL_B = k(1-q)M^* \quad \ldots (10)
\]

\[
\delta (\sum m_ip_iX_i + \sum \sum A_{ji}p_j + w\sum L_i) = (1-q)M^* \quad \ldots (11)
\]

\[
\sum m_ip_iX_i + m_HwL^* = M^* \quad \ldots (12)
\]

\[
F_i = \frac{wL^*}{p_i} + A_{iB} \quad \ldots (13)
\]

\[
X = (1-A)^{-1} F \quad \ldots (14)
\]

where \( \delta \) is the debt-equity ratio of industries and \( k \) is the rate of interest.

Equation (9) needs to be interpreted carefully. In line with static general equilibrium theory, it has been supposed that the rate of profit on equity capital is zero. Therefore, the return on equity capital is

\[
(1 - \delta)r(m_ip_iX_i + \sum A_{ji}p_j + wL_i) = 0
\]

Therefore, equation (9) requires that the sales revenues of the industries be sufficient to cover only the whole of input and wage costs and the interest costs of their borrowings. It should be noted that the net national product at factor cost and at market prices continues to be \( wL^* \), i.e. the net interest paid by industries does not feature in it. This is readily seen by substituting (10) and (11) in equation (9) on the left hand side and adding the equations across industries. It is suggested that the banks do not now levy service charges on depositors but recover their intermediation costs from the interest payments of borrowers. Therefore, nothing is netted out from the wage income in equation (13). Also, since the deposits are demand deposits no interest is paid on them. Equations 9-14 contain \( 2n+3 \) independent equations to
determine as many unknowns, i.e. $n$ money prices of commodities, $n$ outputs, $1$ money wage rate, $1$ interest rate $(k)$ and $1$ debt-equity ratio $(\delta)$. Equation (9) requires that sales revenues of industries should cover costs, equation (10) requires the interest revenue of banks to cover intermediation costs, equation (11) clears the deposit and loan markets, equation (12) is the quantity equation that clears the money market and equations (13) and (14) clear the commodity markets. To prove the existence of a full employment market clearing equilibrium we proceed as follows. Let $d = \text{diag}(\delta km)$ and $E_B$ be the column vector containing $A_{iB}$. Then the price equations (9) in matrix notation are

$$Pd + (1+\delta k) PA + (1+\delta k)wL = P$$

so that

$$(1+\delta k)wLX = P[I-A-\delta kA - d](I-A)^{-1} F$$

$$= PF - \delta kPAX - PdX$$  \hspace{1cm} \text{(15)}$$

From equation (13)

$$PF = wL^* + PE_B$$

$$= wL^* + k(1-q)M^* - wL_B$$

$$= wL^* - wL_B + \delta k[\sum m_ip_iX_i+PAX+wLX]$$

$$= wL^* - wL_B + PdX + \delta kPAX + \delta kwLX$$

In view of (15), however,

$$(1+\delta k) wLX = wL^* - wL_B + \delta kwLX$$

so that

$$LX + L_B = L^*$$

If we let $\alpha_i=0.25$ i=1...4, then for the numerical example above (all data remain the same $A_{iB} = A_{iC}$ and $L_B = L_C$ except that $M^*=100$ now stands for deposits and $q=0.1$ is the fraction of bank deposits held as reserves) an equilibrium is obtained. This is shown in Table 6.

Table 6:

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Output</th>
<th>Real wage rate w/p_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p_1$</td>
<td>9.0609</td>
<td>13.5735</td>
<td>0.2999</td>
</tr>
<tr>
<td>$p_2$</td>
<td>13.8437</td>
<td>18.7658</td>
<td>0.1963</td>
</tr>
<tr>
<td>$p_3$</td>
<td>7.4430</td>
<td>17.9130</td>
<td>0.3651</td>
</tr>
<tr>
<td>$p_4$</td>
<td>19.5019</td>
<td>8.1921</td>
<td>0.1393</td>
</tr>
<tr>
<td>$w$</td>
<td>2.7176</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>$k$</td>
<td>0.2832</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>$\delta$</td>
<td>0.1345</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Even though the material and labour requirements of the banking system are identical with those of the payment banking system of the earlier section, the total intermediation costs stand at $k(1-q) M^* = $26.73 for the former and $p_iM^* = $24.95 for
the latter, so far as our examples are concerned. But that could be the other way round as well. In reality, however, the credit banking system is likely to be more cost efficient because (i) it can help agents to economise their cash balance coefficients $m_i$ and $m_{H}$ due to banking products like sweep and cash credit facilities (ii) it can help industries access resources that would otherwise remain idle, and allow them to expand their scales of production.

Consider now the consequences of an excess demand for money. If, $a_i = 0.2 \forall i = 1 \ldots 4$, and $a_D = 0.2$ (a fraction of household income devoted to holding additional deposits) the resulting disequilibrium is shown in Table 7.

**Table 7:**

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Output</th>
<th>Real wage rate w/p_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>p_1</td>
<td>9.6792</td>
<td>10.7168</td>
<td>0.2909</td>
</tr>
<tr>
<td>p_2</td>
<td>14.7023</td>
<td>14.7825</td>
<td>0.1915</td>
</tr>
<tr>
<td>p_3</td>
<td>7.9092</td>
<td>14.0856</td>
<td>0.3560</td>
</tr>
<tr>
<td>p_4</td>
<td>20.6279</td>
<td>6.4977</td>
<td>0.1365</td>
</tr>
<tr>
<td>w</td>
<td>2.8164</td>
<td>--</td>
<td>V_y = 5.5665</td>
</tr>
<tr>
<td>k</td>
<td>0.2970</td>
<td>--</td>
<td>V_y = 5.2531</td>
</tr>
<tr>
<td>δ</td>
<td>0.1620</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

Observe that in the disequilibrium that obtains in Table 7, not just the money prices but the relative prices and the real wage rate have undergone a change. It is not just a case of downward adjustment of quantities and employment with fixed money wage and money prices (the so-called Keynesian quantity adjustment), both the monetary and real price-wage sets undergo a change because the interest rate $k$ and the debt equity ratio $δ$ change. Also in the course of correcting the disequilibrium and restoring the full employment equilibrium depicted in Table 9, both prices and outputs are required to adjust.

The illustrations of the deflationary gap depicted in Tables 2 and 7 for the currency and credit money systems are open to the objection that we have not permitted two inbuilt stabilizing mechanisms to play their role. The first mechanism consists of the voluntary reductions in the supplies of labour due to the decline in the real wage rate caused by the deflationary gap; to the extent that a decline in the real wage rate causes a decline in the willingness to work, the effective supply of labour $L^*$ would shrink and cause the size of unemployment $L^* - L_d$ to decline as well. This objection is valid as far as it goes. But the point is that it does not go very far. This is readily seen from the illustrations themselves. Suppose that the ideal situation obtains in which a decline in the real wage rate (measured say in terms of commodity 1) is such as to reduce $L^*$ by exactly such an amount as to eliminate unemployment, i.e., $dL^* = L^* - L_d$. In effect the slopes of the labour supply functions $dL^*/dw^*$ ($w^*$ is the real wage rate) for Tables 2 and 7 would have to be 61500.66 and 2222.22 and their elasticities ($dL^*/dw^*)$ ($w^* / L^*$) would have to be 201.906 and 6.664 respectively. But observe that the underlying economic systems of Tables 2 and 7 are otherwise identical except that the former has payments banks and the latter has payments-cum-lending banks. That is not all. Different sizes of the deflationary gap also call for widely different elasticities of labour supply to correct the unemployment. Will labour supply elasticities in practice vary with the monetary regime? Will they vary with the size of the deflationary gap? And, if so, will they possess the desired size? It is difficult to find satisfactory answers to these questions. In their absence it is best to conclude that the labour supply
functions do not provide reliable inbuilt devices to correct the unemployment equilibrium and to suppose instead that the level of employment is determined by the effective demand for labour which, in turn, is determined by the effective demand for outputs.

The second inbuilt mechanism that has a potential to restore the level of aggregate demand lies in the process of financial intermediation itself. In the credit banking system banks convert deposits into loans and loans are being used by firms to purchase inputs and labour. So if banks find themselves with excess deposits they will use (at least part of them after providing reserves) to make additional loans which firms will use to buy inputs and hire labour and pull up the level of aggregate demand. This mechanism too does not work in the automatic mode. To see why consider Table 7. As it stands it shows a contradictory situation. In fact with only 80 units of labour employed and earning and spending $225.312 ($2.816x80) the gross output vector actually produced is (8.57, 11.926, 11.37, 5.28) with money prices and real wage rates as shown in the table. At these actual output and employment levels the demand for money (equation 12) stands at $80 and the demand for loans (equation 11) stands at $72. Accordingly, the actual balance sheet of the banks shall stand as shown in Table 8.

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Deposits</td>
<td>12.5057</td>
</tr>
<tr>
<td>Household Deposits</td>
<td>87.5936</td>
</tr>
<tr>
<td>Total Liabilities</td>
<td>100</td>
</tr>
</tbody>
</table>

In short the required household deposits for transactions decline to (0.3) ($225.312) = $67.5936 with $20 being the “precautionary” deposits which are carried by banks as excess reserves.

In parallel with the earlier case of currency money, Walras’s law holds – the excess demand for money balances, $\alpha_D w L^*$, equals the excess supply of labour, $w(L^* - L_d)$, so that $\alpha_D L^* = L^* - L_d = 20$, which in value terms is $57.6814$. It is quite obvious from the context itself that there is nothing that monetary policy can do. The deflationary gap has arisen in a situation in which none of the instruments of monetary policy are active. Therefore, it can be eliminated by deficit financing of $54.4460$ to finance government purchases of $G=1.09$ units each of the four commodities and restore the full employment equilibrium shown in Table 9. It will be observed that in this case, too, the physical multipliers, that is to say, increments in gross outputs due to additional purchases of 1.09 units of the commodities, are all greater than 1.09 units. The real wage rate measured in terms of the four commodities is seen to rise in the course of attaining the full employment equilibrium by means of an expansionary fiscal policy. Observe that in this case there is no need to finance the entire deficit by printing notes. It can be partly financed by issuing bonds to the banks/public and obtaining the idle balances with them.
Table 9:

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Output</th>
<th>Real wage rate w/p_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>p_1</td>
<td>9.0810</td>
<td>13.0905</td>
<td>0.2996</td>
</tr>
<tr>
<td>p_2</td>
<td>13.8719</td>
<td>18.6800</td>
<td>0.1961</td>
</tr>
<tr>
<td>p_3</td>
<td>7.4583</td>
<td>17.1000</td>
<td>0.3648</td>
</tr>
<tr>
<td>p_4</td>
<td>19.5391</td>
<td>8.5009</td>
<td>0.1392</td>
</tr>
<tr>
<td>w</td>
<td>2.7210</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>k</td>
<td>0.2837</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>δ</td>
<td>0.1354</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

The actual story of the consequences of a deflationary gap in a credit money economy is likely to unfold along the following dramatic but by now familiar lines. Bank loans will start going bad. [Stated in terms of the equations the size of default will be \( \delta K(1 + k) \)]. The ability of banks to service their depositors will begin to erode. A crisis of confidence will build up and if unchecked may lead to runs on banks. Government may rush to the rescue by, say, financing deficits to acquire the bad assets of banks (quantitative easing) and pumping reserves into them. However, in the face of (a) bad debts experienced by the banks and (b) the unwillingness and inability of industries to service additional debts due to a general decline in demand, its impact would be limited at best to banks carrying excess reserves and sustaining the confidence of their depositors. Fiscal policy fails if it attempts to employ the monetary channel for its operation\(^{(7)}\). On this basis Krugman (1998) has called for the revival of the idea of liquidity traps in which the pumping in of the monetary base into banks merely ends up in additions to reserves without spilling over into outputs. Whether this manner of deficit spending would directly remedy the deflationary situation is doubtful. Deficit financing can remedy the situation only if it is used to purchase goods and labour either directly or indirectly but not otherwise. Krugman (2015) goes on to state,

> “An economy that is depressed even with zero interest rates is, in effect, an economy in which the public is trying to save more than business are willing to invest. In such an economy the government does everyone a service by running deficits and giving frustrated savers a chance to put their money to work”.

It may be noted though that in our model the trap can arise at any positive interest rate which however must be the lenders’ minimum rate.

Even though, in the foregoing, the disequilibrium consequences of an excess demand for money have been illustrated with reference to households, it is important to note that this will be true of excess demand for money from industries too. This excess demand must be necessarily shown in terms of additional money balances, \( m_i p_i X_i \), on the left hand sides of the price equations with no corresponding term on the right hand side. The resulting net national income equation will be

\[
\sum m_i p_i X_i + w L^* = \sum p_i X_i - \sum \sum A_{ji} p_j - \sum A_{ij} p_j \]

\( \ldots (15) \)

In equation (15), the firms are using a part of their sales revenue to hoard cash. In this case, even if there is no excess demand for money from households, there will be a deflationary gap. Alternatively, the deflationary gap may occur because firms disinvest their commodity stocks, say, on fears of political or industrial unrest and
hold the proceeds as deposits but refrain from taking additional loans so that these funds are carried by banks as excess reserves.

A notable feature of the systems of equations (5) to (8) for currency money and (9) to (14) for credit money is that they conform to Walras’ Law and explicitly include the quantity theory of money as an assumption (equations 7 and 12). That has not prevented the systems from generating disequilibria; indeed, the disequilibria are such that the excess demand for money equals the excess supply of labour, with all other markets cleared. But both mechanisms fail to correct the situation. Walras’ law, when it operates in a barter economy, corrects the relative prices; by raising the prices of commodities in excess demand it causes demands to decline and supplies to rise and, by simultaneously causing the prices of commodities in excess supply to decline, it causes demands to rise and supplies to decline. So, in the situation under consideration, Walras’ law, if it has to function as a corrective mechanism, should ensure that the wage rate declines and/or the price of money rises so that the quantity of labour demanded rises while its supply declines and the quantity of money demanded declines and it supply rises. The former is not possible because the wage-price set is wholly determined by the price equations and the quantity theory equation. The latter is not possible either, because the price of money is by definition fixed at 1, and, although it is produced by government at zero cost, the government is a not-for-profit entity which produces money as and when it requires to do so for its own purposes not necessarily related to fulfilling the excess private demand for money e.g. to finance wars. The quantity theory mechanism also fails to function; in a situation of an excess demand for money it is expected to pull down the wage rate and prices and lower the demand for money. It is unable to do so because the wage-price set is wholly determined by the price equations and the quantity theory equation pertaining to the transactions demand for money. It has no room to accommodate any additional demand for money which can only be met by increasing the supply and this can come only from the government.

The situations depicted in Tables 2 and 5 have been called deflationary gaps because the word 'deflationary' normally invokes a situation in which wages and prices would have fallen to such low levels that any correction can only involve raising them to higher levels. But that is misleading. When the gaps are corrected by means of deficit financing, the resulting situation shown in tables 3, 4 and 8 shows a fall in the money wages and prices, increases in outputs of commodities and a definite increase in the real wage rate. In other words, deficit financing made to correct the deflationary gap has the effect of increasing the real wage rate in the course of raising output and employment!

Disequilibrium with an inflationary gap is seen to arise if previously hoarded cash is brought into play in the market for currently produced outputs, whether by industries or households. In that case, \( LX + L_B > L^* \) and the disequilibrium can be corrected by means of a surplus budget. It also arises if governments’ deficit spending exceeds that which is required to clear the deflationary gap in which case the correction can be made either by reducing the deficit or by employing the instruments of monetary policy, e.g., impositing of CRR
VI Doctrinal Discussion

The general theme of this paper has been a subject of an extensive debate and unending controversy among several competing schools of economic thought. This literature has employed models of varying degrees of complexity and detail. Even though this paper has employed a classical model of production and prices to inquire into the question of monetary general equilibrium, it is only natural to expect that many of its results will neatly overlap with those in the literature and a few of them will differ. Some remarks are in order on those aspects in which the results or their interpretations differ. The first issue concerns the relationship of Keynesian economics with Say's Law, Walras's Law and the quantity theory of money. Keynes explicitly repudiated Say's law and the quantity theory of money and stated that the General Theory was his 'final escape' from them. The examples of the deflationary gap in sections (4) and (5) of this paper clearly show that Say's law definitely does not work; in the face of an excess demand for money, it is the effective demand for goods that determines their supply and, therefore, the volume of employment. Keynes did not mention Walras's law by name but Keynesians generally agree that Keynesian economics necessarily repudiates Walras's law, that Keynes's unemployment equilibrium must be understood as a 'quantity constrained' non-Walrasian equilibrium in which the effective demand falls short of the notional or planned demand\(^{(9)}\). [Clower 1965, Hahn 1978]. However, in this paper, the unemployment equilibrium in sections (4) and (5) has been found to coexist with Walras's law, i.e. excess demand for money exactly equals the excess supply of labour and the quantity theory of money is included in the model as an explicit assumption (equations 7 and 12). In other words, Walras's law and the quantity theory, even when they hold good or are supposed to hold good, fail to supply automatic inbuilt mechanisms that can ensure a full employment equilibrium. Of course, it is emphatically clarified that this paper is not advocating for the validity of Walras's law and the quantity theory. Instead, the idea is to demonstrate that the Keynesian result obtains even in their presence. And if one or both of them do not hold then there will be further implications which will need to be explored.

The second issue concerns the validity of the IS-LM formulation in its traditional (Hicks, 1937) or the more general Wicksellian versions (eg. Patinkin, 1958 Tobin, 1969, Friedman 1974) for understanding Keynesian economics in relation to the ‘classics’. A perusal of the disequilibrium situation depicted in Table 7 shows that there is an excess of saving over investment caused by, and equal to, the excess demand for money. Clearly this is not a situation that can in any sensible way be depicted on the IS or LM curves. In fact, the situation by itself calls into question the very existence of IS and LM curves; there will be a vertical saving = precautionary/speculative demand for money curve independent of the interest rate, a vertical investment curve will coincide with the interest rate axis because new investment is zero and a vertical supply of money = transactions demand for money curve parallel to them. Neither of the curves determines either the level of income or the interest rate.

The third issue pertains to the cause of the deflationary gap. Clower (1965) and Leijonhufvud (1965) find the cause to lie in the possibility that with quantity constrained demand functions the sum of excess demands for goods, labour and money is less than zero. This is not borne out by the model employed in this paper,
the demand equations 2, 8, and 13 are income constrained but that by itself does not prevent the economy from attaining the full employment equilibrium illustrated in Table 1 and Table 6. Post Keynesians like Kaldor (1981), Kohn (1981), Chick (1983), Rogers (1986) find the cause to lie in the idea that the exogenously given conventional rate of interest at which monetary equilibrium is attained (the point at which the rate of profit equals the rate of interest) is so high that it constrains investment and, therefore, effective demand, at a point of unemployment equilibrium. More comfortable to the intuition is Kurz’s (2016) interpretation according to which the rate of interest remains high, not because of any convention, but because of a high liquidity preference that prevents it from falling to a level that is low enough to induce investment up to the level required by full employment. And Krugman (1998, 2012) has found the cause of the deflationary gap to lie in the appearance of a liquidity trap which is his view arises at very low interest rates(10). In contrast with all these views the model of section (5) shows that full employment equilibrium can be attained even if the rate of interest is positive and greater than the rate of profit which is zero. [Refer illustration in Table 6]. The deflationary gap arises irrespective of the levels of interest or profit if there is a demand for money in excess of that required for performing transactions. In this respect the model echoes the conclusions of Hahn (1977) and Davidson (1978) who found that unemployment equilibrium is the result of the desire for money as a “resting place of saving”. The liquidity trap appears as a direct consequence of the deflationary gap; it causes business failures and bad loans which reduces the willingness of banks to lend and simultaneously increases the inability of industries to borrow resulting in banks carrying excess reserves.

VII Concluding Remarks

The principal objectives of this paper have, I think, been achieved. Firstly, it has been shown that money is an essential addition to a general equilibrium model of a realistic barter economy. The use of money promotes economic efficiency by minimizing transaction costs and allows the economy to deliver greater outputs at lower real prices as compared to a barter economy. Secondly, monetary general equilibrium has been shown to exist if and only if no part of the proceeds or income from the sale of currently produced outputs is hoarded in the form of money. Failing this condition there is general disequilibrium in which at least one market, in particular the labour market, will fail to clear - there will be an excess supply of labour which, in value terms, exactly equals the excess demand for money. No amount of flexibility in the prices, outputs, or the wage and interest rate (all of these are unknowns of the systems of equations in this paper and, therefore, are perfectly flexible) is able to remedy the disequilibrium. The only remedy is deficit financing. As the discussion in the paper and the numerical illustrations clearly demonstrate, money is non-neutral(9). Thirdly two possible automatic inbuilt mechanisms to restore equilibrium (a) the voluntary withdrawal of labour supply due to a reduction in the real wage that takes place with the appearance of a deflationary gap and (b) the in credit from excess money balances that are deposited with banks, are shown to be ineffective. Fourthly, the impact of the policy of quantitative easing has been shown to be limited to cleaning up the balance sheets of banks; it is doubtful if it can go beyond that when industries are undergoing a recession. At best it could be used to coax the employed workers into borrowing and spending.
In closing this paper it would be appropriate to point out that the model employed in this paper is purely static; net investment and growth are absent and the interest rate though it is variable and wholly flexible, is cost-based. Surely a model that allows positive new investment and growth to take place and one in which the structure of interest rates is determined on fund based considerations would yield even more realistic insights.

Notes

1. The post Keynesian literature, however, has continued its study of the neutrality question and has insisted on demonstrating the non-neutrality of money. Chick (1973, 1978), Davidson (1978), Lavoie (1984), Kohn (1986), Rogers (1989) among several others can be referred for some post Keynesian viewpoints.

2. Incidentally I-O models have also attempted to incorporate money; Leontief and Brody (1993), Brody (2000), Tsujimura and Mizoshita (2003) among others have applied I-O techniques to monetary and financial flows. However, this literature has not concerned itself with the question of the existence of monetary general equilibrium.

3. Purely qualitative demand functions of the type $Q_i = f (p_i, w_j)$ that are customary in neoclassical theory have been avoided for the reason that demand functions should be “income-constrained” for any Keynesian type of investigation [Clower (1967)].

4. Of course, perishables and/or services will not qualify to serve as means of payment. Only say D out of N goods which are durable will qualify. But this is no way affects the generality of the argument.

5. I am conscious that I am not strictly adhering to the actual chronology of the technological development of monetary payment mechanisms but that is only because it does not materially affect any of the conclusions.

6. Keynes (1937), p. 216) argued that uncertainty about the future was the main cause for holding excess money balances, “......... partly on reasonable and partly on instinctive grounds our desire to hold money as a store of wealth is a barometer of the degree of our distrust of our own calculations and conventions concerning the future..... The possession of actual money lulls our disquietude ........”.

7. Several countries have been experimenting with negative interest rates to remedy the situation. From June 2014 the European Central Bank began paying -0.1% on private banks’ funds parked with it which was cut to -0.2%. Denmark, Switzerland, Sweden and Japan have also followed negative interest rate policies. It can hardly be said that this policy caused banks’ lending and total spending to surge. The banks are simply living with the negative rates which of course they must be recovering out of charges levied on their customers. Central banks have become so desperate to augment bank lending that from being lender-of-the-last-resort, they are now positioning themselves to become borrower-of-the-last-resort.

8. Niehans (1971) had arrived at the conditions for neutrality of money at a very early stage, “The absence of direct utility and transaction costs for money thus appear as the central assumptions of neutrality.”

9. Clower (1965) has summed up his interpretation of Keynes' contribution by stating, "Either Walras's law is incompatible with Keynesian economics or Keynes had nothing fundamentally new to add to orthodox economic theory."
And more pointedly, Clower (1965) concludes, "Keynesian economics is price theory without Walras’s law". Also see Leijonhufvud (1968).

10. Typically macroeconomic investigations of this question have employed models that are (a) static but (b) yet have room for positive net saving and investment. Can these assumptions at all be reconciled?

References


