

## Some Theoretical Issues in Keynesian Stabilization Policy

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### *1. Introduction*

The standard Keynesian position is expressed by an array of income expenditure models which have some characteristic features in common:

- (1) The crucial linkage transmitting monetary impulses on the pace of economic activity is based on the positions and slope properties of two semi-reduced form equations, the IS–LM curves. Apart from the minor role of price- and interest-induced wealth effects in the expenditure function, the standard model "connects" the monetary sector with the real sector by a single variable, the long-term interest rate. This interest rate linkage is referred to as "the borrowing cost conception of the transmission mechanism". It is argued that borrowing cost is a critical magnitude relative to total investment cost, so that a change in the long-term interest rate, brought about for instance by a change in the money supply, will have a decisive influence on total expenditure for new capital. This argument is based on a priori reasoning, for it is exactly the denial of an empirically strong interest linkage which reduces the model to a simple multiplier equation.
- (2) The standard Keynesian model includes several assets but introduces only two different yields, the rate of return on money, which is set equal to zero, and the long-term interest rate. Real capital, government bonds, bank loans and other private debts are thus regarded as perfect substitutes<sup>1</sup>. Relying on "a two-asset model" is the second common denominator of Keynesian Economics<sup>2</sup>.

Our following discussion is based on these two building blocks. In section 2 we review different versions of the Keynesian paradigm in the context of a one-sector model and state some of the major policy implications. In section 3 we will extend

the basic model by including independent demand and supply functions for both consumption and investment goods. The interplay of the relative output prices modifies and changes some of the major results, especially those bearing on the effects of fiscal policy operations and the indicator problem. We should note that the inclusion of relative output prices as against a set of relative asset prices is quite consistent with the Keynesian view of the transmission mechanism, since it is still the relative borrowing cost conception which specifies the structural conditions for the effectiveness of monetary policy operations.

More recently, some economists have argued that the Keynesian paradigm has not treated the bond-finance and new money-finance cases of government deficits appropriately which has caused incorrect implications regarding the multiplier effects of government spending activities. In section 4 we demonstrate that this position is mistaken. The government budget restraint can be included into the basic system without changing any of the derived conclusions.

The standard system cannot separate the different effects of changes in the money supply brought about by pure wealth increases and open-market operations. In section 5 we demonstrate that a slightly different formulation of the liquidity preference relation allows a more subtle differentiation of various monetary policy operations. Section 6 completes the discussion by including the money supply process. A list of symbols is added as an appendix.

## 2. An Outline of the Keynesian Paradigm: IS-LM and $p$ - $Y$ Analysis

The basic Keynesian model is usually stated as follows<sup>3</sup>:

$$Y = C + I + \frac{\bar{G}}{p} \quad \text{output market equilibrium} \quad (2.1)$$

$$C = C(Y, \frac{\bar{T}}{p}) \quad \text{consumption function} \quad (2.2)$$

$$0 < C_1 < 1; 0 > C_2 > -1$$

$$I = I(i, \frac{w}{p}) \quad \text{investment function} \quad (2.3)$$

$$I_1 < 0; I_2 < 0 \quad \text{under specific conditions:}$$

$$I = I(i) \quad (2.3a)$$

$$I' < 0$$

$$\frac{\bar{M}}{p} = m^*(Y, \frac{\bar{T}}{p}, i) \quad (2.4a)$$

$$m_1^* > 0; m_2^* < 0; m_3^* < 0$$

$$\frac{\bar{M}}{p} = m(Y, i) \quad \begin{array}{l} \text{resp.:} \\ \text{money market equilibrium} \end{array} \quad (2.4)$$

$$m_1 > 0; m_2 < 0$$

$$Y = Y(L; \bar{K}) \quad \text{aggregate production function} \quad (2.5)$$

$$Y' > 0; Y'' < 0$$

$$Y'(L) = \frac{w}{p} \quad \text{demand for labor function} \quad (2.6)$$

$$L = L\left(\frac{w}{p}\right) \quad \text{supply of labor function} \quad (2.7)$$

$$L' > 0$$

To separate the endogenous variables from the exogenous and predetermined variables, we add to the latter variables a bar. We may exclude the government budget restraint for reasons which will be discussed in section 4 of our paper. The general structure of the model is too familiar to enter into the particulars. Only some minor points should be mentioned: (1) We note that the money demand function [equation (2.4a)] includes real tax payments as an argument. This contradicts the assumption that the fiscal parameters are related only to the IS curve. The reasoning for the inclusion of the tax payments into the money demand function is the following: If we interpret real income and real tax payments as proxies for private real wealth, which is not included directly, then a change in  $\bar{T}$  reflects a change in the wealth position of the private sector and will certainly affect the demand for money. If we interpret real income merely as a variable summarizing the factors determining the transactions volume, the exclusion of real tax payments as an argument is justified [equation (2.4)]. This is the standard procedure which we will follow. (2) Differing from the usual procedure, we have included the real wage rate as an additional argument in the investment function. This follows directly from the transformation of the marginal efficiency of capital calculus into a function describing the demand for new capital. Only under special circumstances, which will be stated below, is an omission of this variable justified. (3) We ignore some implicit finance assumptions of the Keynesian model which are crucial for a correct interpretation of the liquidity preference function and the government budget restraint. These problems will be discussed in later sections. (4) Our treatment of tax payments is admittedly crude. We know that income taxes affect the marginal choice between income and leisure and thus the supply of labor. Excise taxes will affect the supply behavior of producers, a.s.o. To simplify the analysis, we have ignored a more detailed specification. Fixing the price level and interpreting the output market equilibrium condition [equation (2.1)] as an aggregate supply function allows a condensation of equations (2.1)–(2.4) into two semi-reduced form equations, the IS and LM curves:

$$i = f\left(Y, \frac{\bar{T}}{\bar{p}}, \frac{\bar{G}}{\bar{p}}\right) \quad \text{IS curve} \quad (2.8)$$

$$f_1 < 0; f_2 < 0; f_3 > 0$$

$$i = g^*(Y, \frac{\bar{T}}{\bar{p}}, \frac{\bar{M}}{\bar{p}}) \quad \text{LM curve} \quad (2.9a)$$

$$g_1^* > 0; g_2^* < 0; g_3^* < 0$$

$$i = g(Y, \frac{\bar{M}}{\bar{p}}) \quad \text{LM curve} \quad (2.9)$$

$$g_1 > 0; g_2 < 0$$

According to the standard procedure, we exclude the real wage rate as an argument of the investment function. The suppression of the supply behavior of firms leaves no room for a price-theoretical explanation of the demand for new capital.

A decrease in  $\bar{p}$  in equation (2.8) corresponds to a weighted increase in both  $\bar{T}$  and  $\bar{G}$ . The effect or total impulse of a policy measure is defined as the induced change in the equilibrium values of the endogenous variables as a consequence of a change in one or more of the exogenous policy variables. These total impulses are described as total derivatives involving system parameters.

To correspond to the meaning of the definition of the transmission mechanism in the usual sense, these total derivatives should be expressed in term of the levels and partial derivatives of the variables as specified by the original structural equations of the complete system:

$$\frac{\partial Y}{\partial \bar{M}} = \frac{-I'}{\Delta \bar{p}} > 0; \frac{\partial Y}{\partial \bar{T}} = \frac{-m_2 C_2}{\Delta \bar{p}} < 0; \frac{\partial Y}{\partial \bar{G}} = \frac{-m_2}{\Delta \bar{p}} > 0 \quad (2.10)-(2.12)$$

$$\frac{\partial i}{\partial \bar{M}} = \frac{C_1 - 1}{\Delta \bar{p}} < 0; \frac{\partial i}{\partial \bar{T}} = \frac{m_1 C_2}{\Delta \bar{p}} < 0; \frac{\partial i}{\partial \bar{G}} = \frac{m_1}{\Delta \bar{p}} > 0 \quad (2.13)-(2.15)$$

The Jacobian determinant of the system is stated as

$$\Delta = -m_2(1-C_1) - m_1 I' > 0$$

From these total derivatives we can infer the necessary and sufficient conditions for an effective transmission of monetary and fiscal impulses.

Given these results, it is easy to explain why Keynesians advocate a fiscal policy mix which allegedly works more reliably and more directly.

Ever since the Oxford Survey of the late thirties, Keynesians question the responsiveness of investment with respect to a change in the long-term interest rate, the channel through which monetary policy works. This responsiveness determines the total impulse of a variation of the money supply on gross national product. The crucial magnitude determining the effectiveness of fiscal policy is  $m_2$ , a "well-behaved" magnitude<sup>4</sup>.

During the following discussion we will refer to equations (2.8) and (2.9) as version I of the basic Keynesian model. Figure 1 summarizes once more the essential features:

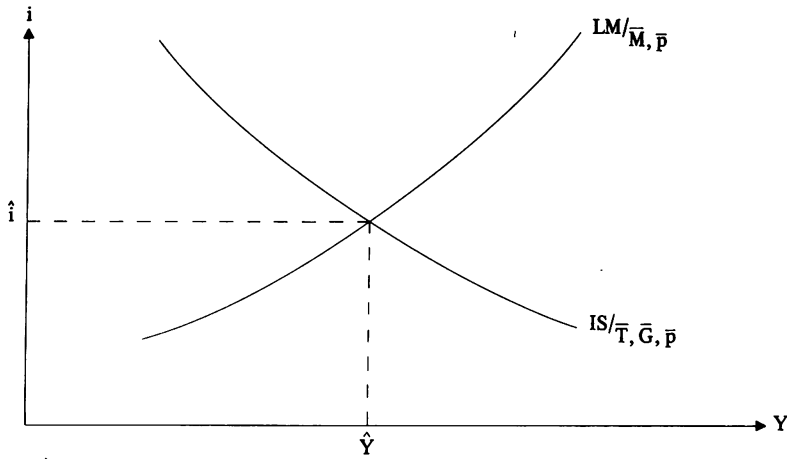


Figure 1

Presented with varying assumptions about rigid prices and wages, money illusion, liquidity traps, fixed input-output coefficients, supplemented by an elasticity pessimism more or less based on ideological preconceptions rather than on empirical evidence, version I could be varied in such a way as to explain much of the academic efforts of more orthodox Keynesians. As a policy model it is the popular frame used to rationalize programs, conceptions and activities of public policy formation during the last decades. As a natural by-product of this development the LM part of the frame became either excluded or ranked as of minor importance.

According to Leijonhufvud, the majority school of the Keynesian tradition encompasses at least two major factions<sup>5</sup>: the "Revolutionary Orthodoxy", which we have briefly characterized in the last paragraph, and the "Neoclassical Resurgence" or the "Keynesian Counterrevolution".

This latter group, which is mainly interested in the "theoretical" issues raised by the "Keynesian Revolution" – omitting the imposition of their own vision on Keynes' program –, regards the institutional implementation of the Keynesian model as an artificial restriction which is completely uninteresting from an analytical point of view. Their basic model can be derived as follows: We solve equations (2.5)–(2.7) for real income, the employment level and the real wage rate. This operation determines real income in the IS–LM frame. If government expenditure and taxes are fixed in real terms, the IS curve can be used to solve for the interest rate. Finally, the LM curve determines the equilibrium value of the price level. It may seem that these solution steps contradict the "Keynesian tradition" by emphasizing the fact that interest rates are approximately determined on the money market. This view is mistaken. It is useless and misleading to classify theories according to the formal procedure which provides for the equilibrium values (or according to the equation which is missing or temporarily excluded)<sup>6</sup>.

$$i = f[Y^f, (\frac{\bar{T}}{p}), (\frac{\bar{G}}{p})] \quad \text{IS curve} \quad (2.16)$$

$$f_1 < 0; f_2 < 0; f_3 > 0$$

$$i = g(Y^f, \frac{\bar{M}}{p}) \quad \text{LM curve} \quad (2.17)$$

$$g_1 > 0; g_2 < 0$$

This model (we refer to it as version II) is illustrated in figure 2.

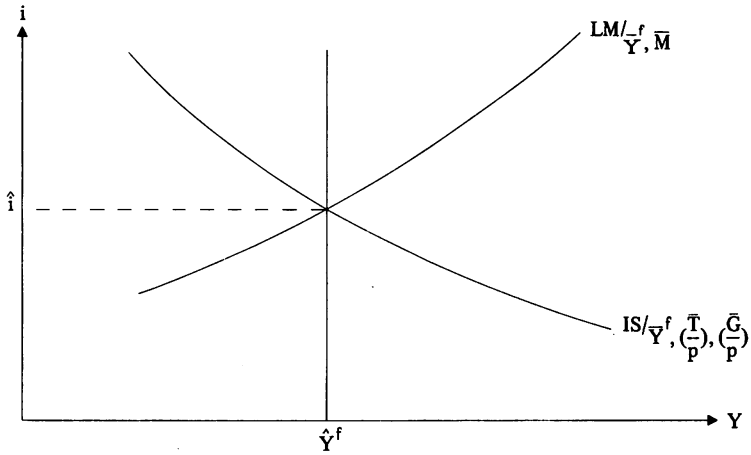


Figure 2

There is probably no macroeconomic model other than the simple full employment Keynesian model which is manipulated more often by students of economics. It seems, however, that some important implications, especially those bearing on the controversy between fiscalists and monetarists<sup>7</sup>, have been overlooked. If we introduce real tax payments, real government expenditure and the nominal money supply as policy parameters, the results are:

$$\frac{\partial i}{\partial Y^f} = \frac{(1 - C_1)\bar{M}}{\Delta p^2} > 0; \quad \frac{\partial p}{\partial Y^f} = \frac{-I'm_1 - m_2(1 - C_1)}{\Delta} < 0 \quad (2.18)-(2.19)^8$$

$$\frac{\partial i}{\partial (\frac{\bar{T}}{p})} = \frac{-C_2\bar{M}}{\Delta p^2} < 0; \quad \frac{\partial p}{\partial (\frac{\bar{T}}{p})} = \frac{m_2 C_2}{\Delta} < 0 \quad (2.20)-(2.21)$$

$$\frac{\partial i}{\partial (\frac{\bar{G}}{p})} = \frac{-\bar{M}}{\Delta p^2} > 0; \quad \frac{\partial p}{\partial (\frac{\bar{G}}{p})} = \frac{m_2}{\Delta} > 0 \quad (2.22)-(2.23)$$

$$\frac{\partial i}{\partial \bar{M}} = 0; \quad \frac{\partial p}{\partial \bar{M}} = \frac{I'}{\Delta p} = \frac{p}{\bar{M}} \quad (2.24)-(2.25)$$

where  $\Delta$  is defined as

$$\frac{I' \bar{M}}{p^2} < 0$$

If, however, we consider nominal tax payments, nominal government expenditure and the nominal money supply as policy instruments, we derive the following results:

$$\frac{\partial i}{\partial \bar{Y}^T} = \frac{(1 - C_1) \bar{M}}{\Delta^* p^2} - m_1 \frac{\bar{C}_2 \bar{I} + \bar{G}}{\Delta^* p^2} \leq 0; \quad \frac{\partial p}{\partial \bar{Y}^T} = \frac{-m_1 I' - m_2 (1 - C_1)}{\Delta^*} < 0 \quad (2.26)-(2.27)$$

$$\frac{\partial i}{\partial \bar{T}} = \frac{-C_2 \bar{M}}{\Delta^* p^3} < 0; \quad \frac{\partial p}{\partial \bar{T}} = \frac{m_2 C_2}{\Delta^* p} < 0 \quad (2.28)-(2.29)$$

$$\frac{\partial i}{\partial \bar{G}} = \frac{-\bar{M}}{\Delta^* p^3} > 0; \quad \frac{\partial p}{\partial \bar{G}} = \frac{m_2}{\Delta^* p} > 0 \quad (2.30)-(2.31)$$

$$\frac{\partial i}{\partial \bar{M}} = \frac{C_2 \bar{T} + \bar{G}}{\Delta^* p^3} < 0; \quad \frac{\partial p}{\partial \bar{M}} = \frac{I'}{\Delta^* p} > 0 \quad (2.32)-(2.33)$$

The signs are derived under the condition that

$$\Delta^* = \frac{I' \bar{M}}{p^2} + m_2 \frac{C_2 \bar{T} + \bar{G}}{p^2} < 0 \text{ and } C_2 \bar{T} < \bar{G}$$

This implies that the budget is either balanced, mildly contractive or on a deficit basis<sup>9</sup>.

If, on the other hand, the budget is overly restrictive,  $\Delta^*$  can change its sign, which leads to a corresponding change in the signs of the total derivatives in (2.26–2.35). Equations (2.24) and (2.25) show the familiar results that money is "neutral" if the budget position is fixed in real terms. A change in the money supply leads to a proportional change in the price level without affecting the long-term interest rate. A more interesting case is the change of the money supply under conditions of "money illusion" in the government's taxing and spending activities: If the budget is slightly contractive, balanced or expansive, a change in the money supply leads to a decrease in the long-term interest rate and to a less than proportional fall in the price level. The total impulse depends on the current budget position. The position of the budget preconditions the effectiveness of monetary policy [equations (2.32)–(2.33)].

Judged from our derivatives, we can derive that the interest rate behavior is a much less reliable indicator of the thrust of monetary policy than for instance the money stock. Given our model, it is less probable that the interest rate has a high degree of systematic association with nominal income, our target variable, than the money

stock. This follows from the fact that it is more likely that the price level is positively related to the behavior of the money stock with the consequence of a positive association with nominal income. Similar results can be derived for situations of less than full employment.

To conclude our discussion of the basic Keynesian model, we introduce version III, a version which is used in more sophisticated Keynesian stability discussions. We derive this version by solving equations (2.1)–(2.4) of our basic model for an aggregate demand function, which expresses the price level as a function of real income and the policy parameters, and by solving the aggregate production function and the demand for labor function for an aggregate supply curve. We assume that the money wage rate is predetermined. Our derivation is appropriate if we consider situations of less than full employment. If we reach the full employment level, we have to change the procedure, for now the supply of labor curve becomes operative. The aggregate supply curve is backward bending at the full employment level<sup>10</sup>. This property could prevent an overall equilibrium solution of our model.

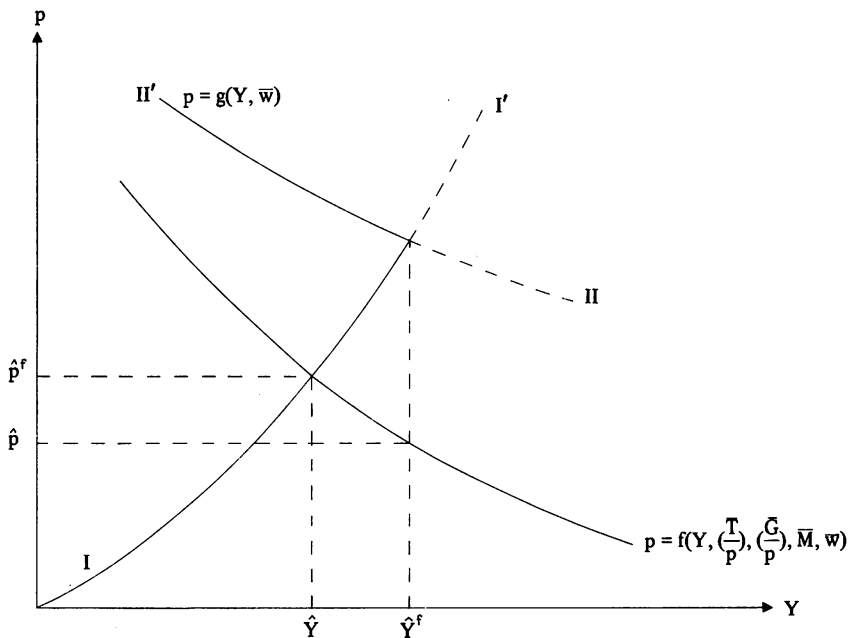


Figure 3

The two supply curves I' and II' in figure 3 correspond to the two possible cases described: a substitution of either the demand for labor function or the supply of labor function over the full range of possible variations of the real wage rate. If we liberate the labor market from its institutional restraints, the edge of the ag-



gregate supply curve describes a line parallel to the  $p$ -axis. This line fixes the full employment income level.

Since we already discussed the workings of the model under conditions of full employment, and will explain the underemployment situation with the aid of a two sector model, we can omit a further discussion and state only the signs of the derivatives. To simplify the computation, we assume that the budget position is fixed in real terms:

$$p = f(Y, (\frac{\bar{T}}{p}), (\frac{\bar{G}}{p}), \bar{M}, \bar{w}) \quad \text{aggregate demand curve} \quad (2.34)$$

$$f_1 < 0; f_2 < 0; f_3 > 0; f_4 > 0; f_5 < 0$$

$$p = g(Y, \bar{w}) \quad \text{aggregate supply curve} \quad (2.35)$$

under situation of un-  
employment

$$g_1 > 0; g_2 > 0$$

We note that for the first time the real wage rate as an argument of the investment function becomes operative. Under version I of our model both the nominal wage rate and the price level were arbitrarily fixed, and under version II the real wage rate was uniquely determined on the labor market, so that in both cases this argument dropped out.

The economically appealing slope properties of the aggregate demand curve in figure 3 and the unconditioned sign specifications of the derivatives hide a fundamental ambiguity which is caused by the inclusion of the real wage rate in the investment function. The stated results are only valid if we introduce an a priori unjustified order condition:  $I_1 \frac{\bar{M}}{p^2}$  must be absolutely greater than  $m_2 I_2 \frac{\bar{w}}{p^2}$ . The interest responsiveness of the demand for new capital must be stronger than the real wage responsiveness. Given this order condition, we can summarize the qualitative effects of the impulse factors as follows:

$$\frac{\partial Y}{\partial (\frac{\bar{T}}{p})} < 0; \frac{\partial Y}{\partial (\frac{\bar{G}}{p})} > 0; \frac{\partial Y}{\partial \bar{M}} > 0; \frac{\partial Y}{\partial \bar{w}} < 0 \quad (2.36) - (2.39)$$

$$\frac{\partial p}{\partial (\frac{\bar{T}}{p})} < 0; \frac{\partial p}{\partial (\frac{\bar{G}}{p})} > 0; \frac{\partial p}{\partial \bar{M}} > 0; \frac{\partial p}{\partial \bar{w}} \leq 0 \quad (2.40) - (2.43)$$

The basic ambiguities about the effects of different policy operations will arise, as demonstrated in the discussion of version II, if we fix the government budget structure in nominal terms.

### 3. Extension to a Two-Sector Model: Relative Prices and Related Issues

Keynes' own efforts were always directed towards a disaggregation of total "output" into two broad categories of goods: investment goods and consumption goods. This is clearly demonstrated in his discussion of the "marginal efficiency of investment" schedule which explicitly includes both the demand and supply functions for investment goods as distinct from the corresponding demand and supply functions for consumption goods. This procedure conserves a minimum price theoretical foundation of aggregate demand and supply analysis and focuses directly on the market conditions of two industries which could for instance clarify the analytical basis of the key-industry conception of modern Keynesian stabilization policy. A theoretical advantage of the explicit introduction of the demand and supply conditions of investment goods is to give a more rigorous definition of the marginal efficiency of capital versus marginal efficiency of investment concepts which are often introduced in a very confusing way into the one-good world of modern textbook Keynesianism<sup>1</sup>. A simple two-sector model of employment, income and the price level could be introduced as follows:

$$I = I^c + I^i + \frac{\bar{I}^g}{q} \quad \text{market equilibrium for investment goods} \quad (3.1)$$

$$I^c = I^c(i, q, p, w) \quad \text{demand function for I-goods of the C-goods industry} \quad (3.2)$$

$$I_1^c < 0; I_2^c < 0; I_3^c > 0; I_4^c < 0$$

$$I^i = I^i(i, q, w) \quad \text{demand function for I-goods of the I-goods industry} \quad (3.3)$$

$$I_1^i < 0; I_2^i > 0; I_3^i < 0$$

$$C = C^p + \frac{\bar{C}^g}{p} \quad \text{market equilibrium for consumption goods} \quad (3.4)$$

$$C^p = C^p\left(\frac{pC + qI}{p}, \frac{\bar{T}}{p}\right) \quad \text{consumption function} \quad (3.5)$$

$$0 < C_1 < 1; 0 > C_2 > -1$$

$$Y = \frac{pC + qI}{p} \quad \text{real gross national product in terms of consumption goods}$$

$$\frac{\bar{M}}{p} = m^*\left(\frac{pC + qI}{p}, i\right) \quad \text{money market equilibrium} \quad (3.6a)$$

$$m_1^* > 0; m_2^* < 0$$

We assume that  $m^*$  is linear homogeneous in "real income" and write:

$$\frac{\bar{M}}{p} = m(i) \frac{pC + qI}{p} \quad \text{money market equilibrium} \quad (3.6)$$

$$m' < 0$$

$$I = I(L^i; \bar{K}^i) \quad \text{production function for I-goods} \quad (3.7)$$

$$I' > 0; I'' < 0$$

$$C = C(L^c; \bar{K}^c) \quad \text{production function for C-goods} \quad (3.8)$$

$$C' > 0; C'' < 0$$

$$I'(L^i) = \frac{w}{q} \quad \text{demand for labor function of the I-goods industry} \quad (3.9)$$

$$C'(L^c) = \frac{w}{p} \quad \text{demand for labor function of the C-goods industry} \quad (3.10)$$

$$L = L\left(\frac{w}{p}\right) \quad \text{supply of labor function} \quad (3.11)$$

$$L = L^i + L^c \quad \text{definition of employment} \quad (3.12)$$

Most equations are familiar from our previous discussion. A few points, however, should be noted: If we write the demand for money function analogously to the one-sector model, it will include nominal income deflated by the consumption goods price level, thus emphasizing the portfolio behavior of consumers. Because the function should also include the portfolio behavior of firms, equation (3.6) appears as an acceptable approximation.

Analogously to our discussion in the last section, we present the two-sector model in three versions. If we arbitrarily fix the nominal wage rate, the price level of both investment and consumption goods, and interpret equations (3.1) and (3.4) as supply functions, equations (3.1)–(3.6) define a set which is economically equivalent to our previously derived equations defining the IS–LM curves.

We introduced real gross national income in terms of consumption goods:

Because  $p$  and  $q$  are fixed, this variable is a linear homogeneous function of  $X =$

$\frac{pC + qI}{pC^* + qI^*}$ , where  $C^*$  and  $I^*$  are base quantities.  $X$  defines a true quantity index from which follows that we can apply the Hicks Composite-Good Theorem<sup>12</sup> and write:

$$i = f\left(X, \bar{w}, \frac{\bar{I}^g}{\bar{q}}, \frac{\bar{C}^g}{\bar{p}}, \frac{\bar{I}}{\bar{p}}\right) \quad \text{IS curve} \quad (3.13)$$

$$i = g(X, \bar{M}) \quad \text{LM curve} \quad (3.14)$$

All the mathematical derivations of the last section as applied to the basic model could be restated without any resultant change of the main consequences.

This is not true for version II of our extended model which corresponds to the full employment solution of our basic model. There is no unique real wage-employment combination describing a full employment solution. Changes in the relative output prices have feedbacks both on the relative shares of the labor force employed in the two sectors and on total employment. This forces us to work through the complete model. There is no formal equivalent to the IS–LM frame under full employment conditions.

If we differentiate our extended model totally with respect to all policy parameters, the row by row result can be stated in the form of a labeled coefficients matrix from which all our further conclusions can be derived (table 1).

The labeled coefficients matrix can be written more compactly in the partitioned forms

$$\begin{pmatrix} \underline{0} & \underline{1} & \underline{V} \\ \hline \hline \underline{\mu} & \underline{1} & \underline{A} \end{pmatrix} \quad \text{resp.} \quad \begin{pmatrix} \underline{0} & \underline{1} & \underline{V^*} \\ \hline \hline \underline{\mu} & \underline{1} & \underline{A} \end{pmatrix} \quad (3.15)–(3.16)$$

$\underline{A}$  and  $\underline{A^*}$  contain the elements of the Jacobian determinants of our two-sector model augmented by 4 columns defining the coefficients of the policy parameters. We may either define the fiscal policy instruments in nominal terms or in real terms with the corresponding change in the columns 7, 8, 10, 11 and 12. This defines  $\underline{A}$  and  $\underline{A^*}$ . The meaning of the other matrices is self-evident.

It should be recalled that we exclude all effects of the so-called built-in-stabilization of the government budget. This procedure is more flexible because we can always include these effects by defining an appropriate mathematical restriction on the impulse equations. Only in case of estimation and forecasting we have to formulate our model in terms of various directly controllable parameters, for instance in the case of fiscal policy in terms of various tax parameters.

The above stated matrices refer to what we introduce as version II of our extended model which defines the "full employment" case. If we exclude row number 8 which is associated with equation (3.11), the supply of labor function, and if we switch the signs of the elements of column 9, an operation which excludes the nominal wage as an endogenous variable, we get a system equivalent to version III of our basic model. The associated labeled coefficients matrix is defined as follows:

$$\begin{pmatrix} \underline{0} & \underline{1} & \underline{V'} \\ \hline \hline \underline{\mu'} & \underline{1} & \underline{A'} \end{pmatrix} \quad \text{resp.} \quad \begin{pmatrix} \underline{0} & \underline{1} & \underline{V'^*} \\ \hline \hline \underline{\mu'} & \underline{1} & \underline{A'^*} \end{pmatrix} \quad (3.17)–(3.18)$$

We know from our discussion of the basic model that an unrestricted labor market guarantees a unique full employment equilibrium value for real income. Fiscal and monetary policy can only affect the structure of the aggregate absorption rate but



not the total. As mentioned, these results are no longer valid in the context of a two-sector model, for both nominal and "real" income can be affected by various fiscal and monetary policy measures. We have to include the complete model structure and work through all of the equations in order to derive the desired information. The structure of version III of our extended model is somewhat easier to handle. In addition to this, it is certainly a more often used paradigm for shaping overall stabilization policy than the full employment model which is more relevant under growth aspects. We therefore postpone a short discussion of some of the implications of version II and start with a more extensive description of version III.

The signs of the Jacobian determinants associated with  $\underline{A}'$  and  $\underline{A}'^*$  are negative under reasonably stated economic order conditions. This is especially the case for the determinant associated with  $\underline{A}'^*$ . We know from our previous discussion that in the case of a budget situation, fixed in nominal terms, an identification of the signs becomes more difficult.

We first present the effects of various fiscal and monetary impulses referring to version III under the condition of a government budget fixed in real terms. Because the derivatives are rather involved, we display only their signs.

$$\frac{\partial q}{\partial \bar{M}} > 0; \frac{\partial p}{\partial \bar{M}} > 0; \frac{\partial i}{\partial \bar{M}} \leq 0; \frac{\partial I}{\partial \bar{M}} > 0; \frac{\partial C}{\partial \bar{M}} > 0 \quad (3.19)-(3.23)$$

The signs of a total impulse of a change in  $\bar{M}$  on  $I$  and  $C$  must follow from the signs of the same monetary impulse on  $q$  and  $p$ . Given the nominal wage rate,  $q$ ,  $I$  and  $N^i$  (resp.  $p$ ,  $C$  and  $N^c$ ) always move in the same direction. The sign of  $\frac{\partial i}{\partial \bar{M}}$  is indeterminate because both the money stock and nominal income increase, but their quotient, which determines the interest rate, is unknown. Similar results follow if we substitute equation (3.6a) instead of (3.6). This substantiates our previously stated conjecture: the interest rate is a very unreliable indicator for the expansiveness or contractiveness of monetary policy. In our simple model this was due to the fact that the government budget was fixed in nominal terms; in the extended model it follows from the interaction of the relative prices of consumption and investment goods. There is no "money illusion" on the sides of private and government agencies which produces this result, and it is reasonable to expect that, in the case of a budget structure fixed in nominal terms, this basic ambiguity will increase. This result cannot be overstated. It is a much debated problem in recent stabilization policy. We could derive a much stronger critical position using the Keynesian model than for instance the monetarists who argue that it is the divergence of real and nominal interest rates which make the market interest rate a very unreliable indicator. These divergences will only reinforce the uncertainty of a policy based on the interest rate as a monetary indicator.

Given real taxes and real government expenditure for consumption goods, an increase in  $\bar{M}$  is always associated with an increase in nominal income deflated by the consumption goods price index. An increase in the money stock is associated with an overall increase in economic activity measured either in terms of the output rate

of our two industries, in terms of the utilization rate of the labor force or in terms of "real" income.

The inclusion of relative output prices has certainly broadened the transmission mechanism, but it is still the borrowing cost conception on which this mechanism is based and which determines the effectiveness of monetary policy. If the marginal response coefficients of investment demand with respect to changes in the interest rate ( $I_1^c$  and  $I_1^i$ ) are zero in both industries, a change in the money stock will affect neither prices nor quantities of the two gross national product components. The new stock will be absorbed into the portfolios at a lower interest rate.

Recently, Arthur Okun has advanced the so-called key-industry notion of monetary policy<sup>13</sup>. This reasoning is based completely on the borrowing cost conception of the transmission mechanism. This reasoning does not deny an effectiveness of monetary policy, for instance by operating with extreme interest elasticities for the expenditure functions, but argues rather that monetary policy will affect mainly and directly the investment demand of certain key-industries, e.g. the housing industry. The key-industry is characterized by large borrowing cost relative to total investment cost and, because it happens that these industries have not only key positions in a hierarchy defined by the interest criterion but also in a hierarchy of socially desirable categories of goods, monetary policy is said to have an unwarranted allocative effect. The induced accelerative and multiplicative effects of a change in the output of these key-industries are negligible and therefore not worth the price paid in the first instance. If the key-industry conception makes sense at all, it should be advanced in a multi-sector model and not in a one-sector model. In a multi-sector model the conception of the key-industry is untenable, even by relying on the Keynesian paradigm. The connection of all industries by a complex relative price mechanism precludes an a priori conjecture about the role of a special industry, even if we make strong assumptions about the position in the spectrum of one relative price, i.e. the interest rate.

An increase in the money supply leads to an increase in both  $p$  and  $q$ . Their relative magnitude, however, remains indeterminate. In addition to this, we have no information about the effect of the monetary impulse on the interest rate. This implies that we are not able to infer any systematic reallocation of the demand structure for investment goods.

From this we can conclude that we have to reject the basic assumption of the key-industry conception, the conjecture that the position of an industry in a spectrum of marginal interest response coefficients is a meaningful starting point. It is interesting to note once more that the basis for our rejection of the key-industry conception is not derived from the analytics of a different economic model but from the very Keynesian model which was used to rationalize this conjecture.

There is a striking asymmetry between the results of a change in government expenditure for investment goods and a change in government expenditure for consumption goods. The direction of the first change can be uniquely inferred from the structure. An increase in government expenditure for investment goods will raise the price levels of both investment and consumption goods, the rate of interest and the output

levels of the two industries. Because real taxes and real government expenditure for C-goods are kept constant, we infer from the increase in the output level of the consumption goods industry that real income will be higher too.

The signs of the effects of a change in government expenditure for consumption goods cannot be inferred. The same is true for a change in real taxes. These effects are computed by multiplying the results of the first operation by  $C_2^p$ , a negative quantity. These results are sensible if we realize that the price of consumption goods is the deflator used in the computation of real income.

We could, of course, specify some order conditions in order to derive some more information. However, most of these conditions cannot be justified by a priori reasoning. From this we have to conclude that real taxes and real government expenditure for consumption goods are very unreliable policy instruments.

One of the important conjectures of the monetarist position is that monetary policy has predominantly aggregative consequences, whereas fiscal policy is characterized by predominantly allocative effects. The refutation of the key-industry conception strengthened the monetarist position with regard to the aggregative effect of monetary policy, but the same reasoning weakens the second part of the argument: The linkage of our two industries by the relative price structure does not justify an a priori conjecture that a change in government expenditure for investment goods will lead to a decisive rearrangement of the output structure with little effect on the total component.

Until now, the discussion was based on the assumption that the items in the government budget are fixed in real terms. We know from our previous discussion that most of our policy measures become unreliable, if we introduce "money illusion" into the government budget. This has an obvious consequence stated often only programmatically: fiscal and monetary policy should be coordinated. This is certainly not the case, if for instance monetary policy is expansive measured by the increase in the money stock, and fiscal policy at the same time restrictive measured by the real expenditure for the outputs of the two industries.

We conclude our discussion of the two-sector model with a short discussion of version II which corresponds to the full employment case of our basic model. If the government budget position is fixed in real terms, we can derive the classical neutrality proposition: An increase in the money supply will lead to a proportional increase in all nominal variables, leaving constant all real magnitudes including the interest rate. If, however, the government does not offset its budget position after a change in relative and absolute prices, the central monetary authority can affect both the structure and the magnitude of real output. The same is generally true for the fiscal policy effects, because there is no unique full employment solution defined. An exact specification of the results of fiscal and of monetary policy under various assumptions is difficult to derive. This is intuitively plausible: The complete structure determines another relative price, the nominal wage rate, which was previously fixed. This complicates the price mechanism and introduces new problems of interpretation.



#### 4. Supplement: Inclusion of a Government Budget Restraint

Recently, some economists have argued that traditional IS–LM analysis has not treated the bond-finance and new money-finance cases of government deficits appropriately, which has led to incorrect conclusions regarding the multiplier effects of government spending.

This issue needs some clarification because our discussion was presented under the explicit assumption that an exclusion of the government budget restraint is justified.

We will show that a correctly interpreted Keynesian model allows a logically consistent incorporation of the government budget restraint. All the familiar results are valid if we correctly interpretate the implicitly stated finance assumptions of the standard model<sup>14</sup>.

We will try to derive our proposition from a simple variant of our previously stated basic model. We will use version I because it allows a simple exposition of the basic ideas<sup>15</sup>.

$$\frac{W_o}{\bar{p}} = \frac{\lambda Y}{i} + \frac{\bar{N}_o}{\bar{p}i} + \frac{\bar{M}_o}{\bar{p}} - \frac{\xi \bar{T}}{\bar{p}i} \text{ wealth at the beginning of the "period"}^{16} \quad (4.1)$$

$$Y = C\left(\frac{W_o}{\bar{p}}, Y + \frac{\bar{N}_o}{\bar{p}} - \frac{\bar{T}}{\bar{p}}; \lambda\right) + I\left(i, \frac{\bar{w}}{\bar{p}}\right) + \frac{\bar{G}}{\bar{p}} \text{ commodity market equilibrium} \quad (4.2)$$

$$\frac{\bar{M}_1}{\bar{p}} = m\left(\frac{W_o}{\bar{p}}, Y, i; \lambda\right) \text{ money market equilibrium} \quad (4.3)$$

$$\frac{\bar{G}}{\bar{p}} + \frac{\bar{N}_o}{\bar{p}} - \frac{\bar{T}}{\bar{p}} = \left[ \frac{\bar{M}_1}{\bar{p}} - \frac{\bar{M}_o}{\bar{p}} + \frac{N_1 - \bar{N}_o}{\bar{p}i} \right] \frac{1}{\tau} \text{ government budget restraint} \quad (4.4)$$

The operator, which is equal to one divided by the length of the unit time interval, transforms the stock variables into an equivalent flow magnitude.

Given the values of the exogenous variables  $\bar{G}$ ,  $\bar{M}_o$ ,  $\bar{M}_1$ ,  $\bar{N}_o$  and  $\bar{T}$ , or more simply their real values, the four equations are sufficient to determine the four endogenous variables  $\frac{N_1}{\bar{p}}$ ,  $i$ ,  $\frac{W_o}{\bar{p}}$  and  $Y$ .

Equation (4.1) states the implicit finance assumption of the Keynesian model: Gross national product is multiplied by the fraction of nonhuman income to total income and capitalized at the current market interest rate. The operation defines the market value of the capital stock  $\frac{\lambda Y}{i}$ . This procedure is admittedly crude and ignores some

important difficulties, but it is a good first approximation if we assume that all investment projects are financed by issuing common stock or interest bearing debt. To the degree that wealth owners capitalize their tax obligations, the government debt will be offset. Equation (4.2) describes the familiar commodity market equilibrium condition and equation (4.3) the corresponding money market condition. Because

any increase in the supply has to be absorbed into the portfolios of the wealth owners at the end of the period, the demand has to absorb the supply magnitude  $\bar{M}_1$  which includes the money-finance part of the government deficit. Equation (4.4) specifies the outlay and receipt components of the government budget. The budget deficit must be covered either by printing new money or issuing new interest bearing debt. An analogous statement holds for the case of a current surplus. If we hold  $\bar{M}_1$  and  $\bar{T}$  constant, a change in government expenditure for final output will be matched by an equivalent change in the value of government bonds outstanding at the end of the period. Because our representative wealth owner regards all debt instruments as homogeneous goods, he will be indifferent to whether an increase in his wealth is brought about by an increase in the value of government bonds or by an equivalent increase in privately generated wealth, i.e. private investment.

The similarity between this model and our basic Keynesian model should be obvious. Equation (4.4) can be cancelled if we are not interested in the number of bonds outstanding at the end of the period. Neglecting all wealth effects eliminates equation (4.1) and the corresponding wealth arguments in the behavior functions. These operations reduce the model to the familiar IS–LM frame which is defined by equations (4.2) and (4.3). These equations restate equations (1.8) and (1.9) defined in section 1.

### 5. The Liquidity Preference Relation and the Effectiveness of Monetary Policy

The general omission of wealth effects in the standard paradigm does not allow a systematic assessment of different operations leading to an increase in the money supply, i.e. increases brought about by fiscal deficits, open-market-operation or pure wealth changes. In this section we try to demonstrate that a slightly different formulation of the liquidity preference relation allows a more subtle differentiation of these monetary operations.

To illustrate this, we use a variant of version I of our basic model. To this structure we add a wealth restriction

$$\frac{W_o}{\bar{p}} = \frac{\lambda Y}{i} + \frac{\bar{N}_o}{\bar{p}i} + \frac{\bar{M}_o}{\bar{p}} - \frac{\xi \bar{T}}{\bar{p}i} \quad (5.1)$$

From this equation we derive a definition of real income

$$Y = \frac{iW_o - \bar{N}_o - i\bar{M}_o + \xi \bar{T}}{\lambda \bar{p}} \quad (5.2)$$

We substitute this definition into the familiar commodity market equilibrium condition.

$$\frac{iW_o - \bar{N}_o - i\bar{M}_o + \xi \bar{T}}{\lambda \bar{p}} = C \left( \frac{iW_o - \bar{N}_o - i\bar{M}_o + \xi \bar{T}}{\lambda \bar{p}} + \frac{\bar{N}_o}{\bar{p}} - \frac{\bar{T}}{\bar{p}} \right) + I(i) + \frac{\bar{G}}{\bar{p}} \quad (5.3)$$

This equation restates the overall wealth position of the community as a function of the interest rate, the money stock, the number of bonds outstanding at the beginning of the period, taxes due and the volume of government expenditure. The flow magnitudes real income, real consumption and real investment are implicitly included.

$$\frac{W_o}{\bar{p}} = \varphi(i; \frac{\bar{M}_o}{\bar{p}}, \frac{\bar{N}_o}{\bar{p}}, \frac{\bar{T}}{\bar{p}}, \frac{\bar{G}}{\bar{p}}) \quad (5.4)$$

$$\varphi_1 < 0; \varphi_2 = 1; \varphi_3 > 0; \varphi_4 < 0; \varphi_5 > 0$$

To analyze the effects of various monetary policies, we add our liquidity preference function which is modified by the inclusion of real wealth and a vector  $R^e$  describing the individual distribution of expected future interest rates, or otherwise stated: The information about the current rate and the expected individual future rates allows us to derive the distribution of the individual expected holding period yields. In the following discussion we introduce this vector as a parameter. It should be noted that the following exposition does not correctly describe the Keynesian approach to portfolio behavior<sup>17</sup>. Our presentation is a generalization describing a broader class of possible portfolio behavior.

$$\frac{\bar{M}_1}{\bar{p}} = m(\frac{W_o}{\bar{p}}, \frac{iW_o - \bar{N}_o - i\bar{M}_o + \xi\bar{T}}{\lambda\bar{p}}, i; R^e) \quad (5.5)$$

Given the overall budget restriction, we derive the implicitly defined demand function for real securities, i.e. privately issued stock and government net interest bearing debt, remembering the assumption that all private investment is financed by issuing common stock. It is obvious that a more sophisticated analysis would separate the common stock market or the market for real capital from the market for long-term fixed interest bearing debt, which means that we have to determine the supply price of capital (or the required rate on real capital) in addition to the interest rate on long-term government bonds. This modification, however, leads us into the realms of both the monetarists and the proponents of the "New View".

The stock demand for interest bearing claims is derived from the overall budget restraint and the demand for money function.

Total wealth at the end of the period is defined as

$$\frac{W_1}{\bar{p}} = \frac{W_o}{\bar{p}} + \left[ I(i) + \frac{\bar{G}}{\bar{p}} - \frac{\bar{T}}{\bar{p}} \right] \frac{1}{\tau} \quad (5.6)$$

The demand for real interest bearing claims is equal to

$$V^d = \frac{W_1}{\bar{p}} - m(\cdot) \quad (5.7)$$

For the analytical discussion we use the model in the following version:

$$\frac{\bar{M}_1}{\bar{p}} = m(\varphi, \frac{i\bar{p}\varphi - \bar{N}_o - i\bar{M}_o + \xi\bar{T}}{\lambda\bar{p}}, i) \quad (5.8)$$

$$\frac{W_1}{\bar{p}} = \varphi(i, \frac{\bar{M}_o}{\bar{p}}, \frac{\bar{N}_o}{\bar{p}}, \frac{\bar{T}}{\bar{p}}, \frac{\bar{G}}{\bar{p}}) + \left[ I(i) + \frac{\bar{G}}{\bar{p}} - \frac{\bar{T}}{\bar{p}} \right] \frac{1}{r} \quad (5.9)$$

Because the commodity market is always included under conditions of equilibrium, we refer to equations (5.8) and (5.9) as a portfolio model describing the allocation of real wealth on the constituent assets real money balances and real securities.

Figure 4 illustrates the model under the conditions stated.

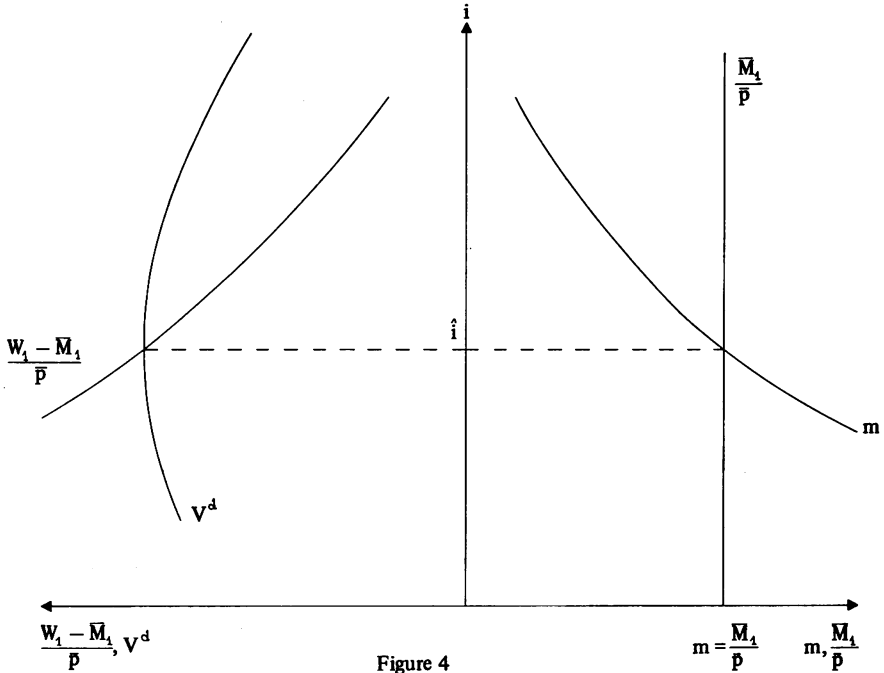


Figure 4

Total real wealth at the end of the period is a function of the interest rate. This variable is measured by the horizontal difference between the curves  $\frac{\bar{M}_1}{\bar{p}}$  and  $\frac{W_1 - \bar{M}_1}{\bar{p}}$ .

The curve  $\frac{W_1 - \bar{M}_1}{\bar{p}}$  includes the equilibrium condition of the commodity market and therefore the changes in real income as a consequence of a variation of real investment which depends on the interest rate. Because the commodity market is included by its equilibrium condition, we know from Walras' law that the equilibrium condition of either one of the remaining markets, i.e. the money or the bond market, does not impose any restriction on the total model structure.

An increase in the interest rate leads to a decrease in the demand for money. The demand will change as the result of a wealth or income effect and a substitution effect. Both effects work in the same direction. Because the change in the interest rate will lead to an opposite change in real wealth, the sign of a change in the interest rate on the demand for real securities is indeterminate.

$$\frac{\partial m}{\partial i} = m_1 \varphi_1 + \frac{m_2}{\lambda} (i \varphi_1 + \varphi - \frac{\bar{M}_0}{\bar{p}}) + m_3 < 0 \quad (5.10)$$

$$\frac{\partial V^d}{\partial i} = \frac{\partial \frac{W_1}{\bar{p}}}{\partial i} - \frac{\partial m}{\partial i} \leq 0 \quad (5.11)$$

We could formally introduce a minimum interest rate at which nobody is willing to hold interest bearing claims, i.e. the liquidity trap. It is obvious that this minimum rate cannot be reached as long as the stock of outstanding interest bearing claims is positive. The current market rate is always greater than this minimum rate at which everybody would convert interest bearing claims into money.

To derive a set of mutatis-mutandis-effects expressing various monetary and fiscal operations leading to an increase in the money supply, we differentiate the model totally with respect to the exogenous variables. The labeled coefficients matrix is stated in table 2.

| 0          | 1<br>$\frac{W_1}{\bar{p}}$ | 2<br>$i$                                      | 3<br>$\frac{\bar{M}_1}{\bar{p}}$ | 4<br>$\frac{\bar{M}_0}{\bar{p}}$ | 5<br>$\frac{\bar{N}_0}{\bar{p}}$                        | 6<br>$\frac{\bar{T}}{\bar{p}}$                            | 7<br>$\frac{\bar{G}}{\bar{p}}$                    |
|------------|----------------------------|-----------------------------------------------|----------------------------------|----------------------------------|---------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------|
| 1<br>(5.8) | 0                          | $-[m_1 \varphi_1 + m_3 + \frac{m_2 I'}{1-C}]$ | -1                               | $m_1$                            | $m_1 \varphi_3 + \frac{m_2}{\lambda} (i \varphi_3 - 1)$ | $m_1 \varphi_4 + \frac{m_2}{\lambda} (i \varphi_4 + \xi)$ | $m_1 \varphi_5 + \frac{m_2 i \varphi_5}{\lambda}$ |
| 2<br>(5.9) | 1                          | $-\varphi_1 - J' \frac{1}{\tau}$              | 0                                | 1                                | $\varphi_3$                                             | $\varphi_4 - \frac{1}{\tau}$                              | $\varphi_5 + \frac{1}{\tau}$                      |

To simplify, we have substituted the partial derivatives from (5.4) where necessary.

Table 2

We derive the following qualitative results:

$$\frac{\partial i}{\partial \frac{\bar{M}_1}{\bar{p}}} < 0; \quad \frac{\partial i}{\partial \frac{\bar{M}_0}{\bar{p}}} > 0; \quad \frac{\partial i}{\partial \frac{\bar{N}_0}{\bar{p}}} > 0; \quad \frac{\partial i}{\partial \frac{\bar{T}}{\bar{p}}} < 0; \quad \frac{\partial i}{\partial \frac{\bar{G}}{\bar{p}}} > 0 \quad (5.12)-(5.16)$$

$$\frac{\partial \frac{W_1}{\bar{p}}}{\partial \frac{M_1}{\bar{p}}} > 0; \frac{\partial \frac{W_1}{\bar{p}}}{\partial \frac{M_0}{\bar{p}}} \leq 0; \frac{\partial \frac{W_1}{\bar{p}}}{\partial \frac{N_0}{\bar{p}}} \leq 0; \frac{\partial \frac{W_1}{\bar{p}}}{\partial \frac{T}{\bar{p}}} \leq 0; \frac{\partial \frac{W_1}{\bar{p}}}{\partial \frac{G}{\bar{p}}} \leq 0 \quad (5.17)-(5.21)$$

Let us compare the effects of the following monetary policy operations:

1. An increase in the endowed stock of money, i.e. a pure wealth increase:

a) If we assume that the money stock at the end of the period is kept constant – which implies that the government has to vary the number of outstanding bonds –, this operation will shift the demand for money function to the right. The interest rate will increase. From equation (5.18) we see that the effect on real wealth is indeterminate.

b) If the government keeps the new money-finance part of the budget balance constant, we have to increase both  $\bar{M}_0$  and  $\bar{M}_1$ . The money demand function and the money supply function will shift to the right. Assuming that  $m_1$  is less than one, this implies that the interest rate will decrease and the stock of real wealth will increase.

2. An increase in the stock of money at the end of the period: This effect describes a discrete open-market operation. The two demand curves in figure 4 depict the conditions for this operation. We may shift the two supply curves along the demand curves and reach any projected target interest rate. From the construction, it follows that in any point the positive or negative excess demand for money is equal to the negative or positive excess demand for securities. Fixing any interest rate, the monetary authority buys (sells) the negative (positive) excess demand for interest bearing

| Change<br>in<br>Ope-<br>ration | Y | i | $\bar{M}_1/\bar{p}$ |
|--------------------------------|---|---|---------------------|
| 1a                             | . | . | .                   |
| 1b                             | + | – | +                   |
| 2                              | + | – | +                   |
| 3                              | + | ? | +                   |
| 4                              | + | ? | +                   |

Assumption:  $0 < m_1 < 1$

Table 3

claims by issuing (withdrawing) the equivalent positive (negative) excess demand for money. An increase in the stock of money at the end of the period as a consequence of open-market operations will lead to a decrease in the interest rate and an increase in real wealth.

3. Money financed government expenditure, i.e. equal changes in  $\bar{M}_1$  and  $\bar{G}$  in the same direction: This operation involves opposite effects on the interest rate. The total effect, therefore, remains indeterminate. The same is valid for the effect on real wealth.

4. Money financed tax reductions, i.e. equal but opposite changes in  $\bar{M}_1$  and  $\bar{T}$ : This operation yields qualitatively similar results as the operation described in (3).

According to the Keynesian paradigm, the interest rate is the best summary indicator of the expansiveness or contractiveness of monetary policy. It is maintained that real income and the interest rate are always inversely related. We conclude the discussion of the liquidity preference relation by examining this statement for the four operations described above (see table 3).

As the table shows, the money stock is the more reliable indicator of the thrust of monetary policy. We recall from our previous discussion that this is generally true for more complicated economic structures.

#### *6. The Role of Money Supply Analysis in Keynesian Economics*

Until now, we have omitted any discussion of the process underlying the supply of money. This omission reflects the attitude of Keynesian thinking, namely the refusal to accept relative price theory as an analytical frame for analyzing economic processes. When Harry G. Johnson commented in his survey of Monetary Theory published in 1962 that money supply theory had been thoroughly neglected in monetary analysis, the criticism was certainly addressed to mainstream Keynesianism and the associated income-expenditure approach. The more recent interest in money supply analysis is connected with two different, but definitely non-Keynesian groupings, the monetarists and the proponents of the "New View".

Our following discussion tries to illustrate the following points:

The basic Keynesian portfolio assumption offering only a choice between long-term interest bearing claims and money, if combined with the Keynesian transmission mechanism, reduces the money supply analysis to a mathematical exercise.

The Keynesian approach does not ascribe an independent role to the credit market in addition to the other markets for loanable funds. This leads to the consequence that the IS—LM frame is still the best summary description of the Keynesian system. Our analysis could be used for a thorough investigation of some of the recently formulated large-scale econometric models which are moulded according to the standard frame: relying on the borrowing cost conception of the transmission mechanism but expanding the monetary subsystem. To illustrate these points, we vary the Brunner-Meltzer money supply theory<sup>18</sup> in such a way as to derive a Keynesian portfolio model.

We start with the following balance sheets:

*Banking Sector*

|                                                      |                                                     |
|------------------------------------------------------|-----------------------------------------------------|
| $\frac{R}{p}$ total commercial banks reserves        | $\frac{D_p^s}{p}$ demand deposits of the public     |
| $\frac{R}{p} = \frac{R_e}{p} + \frac{R_r}{p}$        | $\frac{D_g^s}{p}$ demand deposits of the government |
| excess reserves + required reserves                  | $\frac{D^t}{p}$ time deposits                       |
| $\frac{E}{p}$ earning assets net of capital accounts | $\frac{A}{p}$ discounts and advances                |

*Private Non-Banking Sector*

|                                                                                                                |                                                                  |
|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| $(\frac{\lambda Y}{i} + \frac{\bar{N}_o}{pi} - \frac{E}{p})$ net holdings of long-term interest bearing claims | $\frac{\xi \bar{T}}{pi}$ discounted value of the tax obligations |
| $\frac{M_c}{p}$ currency held by the public                                                                    | $\frac{W_o}{p}$ net wealth of the private sector                 |
| $\frac{D_p^s}{p}$ demand deposits of the public                                                                |                                                                  |
| $\frac{D^t}{p}$ time deposit                                                                                   |                                                                  |

*Consolidated Balance Sheet of the Private Sector*  
(Gurley-Shaw-Case)

|                                                              |                                                                         |
|--------------------------------------------------------------|-------------------------------------------------------------------------|
| $\frac{\lambda Y}{i}$ market value of the real capital stock | $\frac{D_g^s}{p}$ demand deposits of the government                     |
| $\frac{\bar{N}_o}{pi}$ government securities outstanding     | $\frac{A}{p}$ discounts and advances                                    |
| $\frac{M_c}{p}$ currency held by the public                  | $\frac{\xi \bar{T}}{pi}$ discounted value of the future tax obligations |
| $\frac{R}{p}$ total commercial-bank reserves                 | $\frac{W_o}{p}$ net wealth of the private sector                        |



*Consolidated Balance Sheet of the Private Sector*  
(Pesek-Saving-Case)

|                                                              |                                                                                                         |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| $\frac{\lambda Y}{i}$ market value of the real capital stock | $\frac{A\bar{p}}{pi}$ market value of discounts and advances                                            |
| $\frac{\bar{N}_o}{pi}$ government securities outstanding     | $\frac{\xi \bar{T}}{pi}$ discounted value of the future tax obligations                                 |
| $\frac{M_c}{p}$ currency held by the public                  |                                                                                                         |
| $\frac{D_p^s}{p} + \frac{D_g^s}{p}$ total demand deposits    | $\frac{R}{p} + \frac{i^t D^t}{pi}$ discounted values of the debt components of demand and time deposits |
| $\frac{D^t}{p}$ time deposits                                |                                                                                                         |
| $\frac{R}{p}$ total commercial bank reserves                 | $\frac{W_o^*}{p}$ net wealth of the private sector                                                      |

From the last consolidated statement we could derive the corresponding balance sheet of the banking sector under Pesek-Saving-assumptions. The following discussion is based on the Gurley-Shaw assumptions, but all results can be restated in terms of the Pesek-Saving procedure.

From the first consolidated balance sheet of the private sector we derive the overall budget restriction:

$$\frac{W_o}{p} = \frac{\lambda Y}{i} + \frac{\bar{N}_o}{pi} + \frac{M_c}{p} + \frac{R}{p} - \frac{D_g^s}{p} - \frac{A}{p} - \frac{\xi \bar{T}}{pi} \quad (6.1)$$

Using the definition of the adjusted base, the definition simplifies to

$$\frac{W_o}{p} = \frac{\lambda Y}{i} + \frac{\bar{N}_o}{pi} + \frac{\bar{B}_o^a}{p} - \frac{D_g^s}{p} - \frac{\xi \bar{T}}{pi} \quad (6.2)$$

If we disregard the demand deposits of the government, we can interpret the adjusted monetary base as the money stock according to our previous discussions in which we abstracted from the existence of banks.

We have two interesting options: First, we could explain the joint demand of both commercial banks and the non-bank public for the autonomously given stock

$\frac{\bar{B}_o^a}{p}$ . This would preserve a complete formal analogy to the analysis of our last section.

This means that, if we define the money supply as the adjusted monetary base, all our previously stated results remain valid. There is nothing wrong with such an interpretation in the Keynesian world. This formulation can be directly related to the discussion of the real balance effect which is based on this narrower wealth definition.

The other option is to use a money concept in the usual sense. We will show that the first option can be easily derived from this second option.

In addition to our interest rate on all kinds of long-term claims, we introduced the interest rate on time deposits,  $i^t$ . We can get rid of this rate by a typical Keynesian device, namely by postulating a price-setting function, a functional relationship between the two rates:

$$i^t = i^t(i), i^t > 0 \quad (6.3)$$

Following the Keynesian tradition of partitioning all financial and real assets into two broad classes, it is more appropriate to use a money demand function in a broader sense including time deposits.

$$\frac{M}{p} = m\left(\frac{W_o}{p}, Y, i, i^t(i); R^e\right) = \frac{D_p^s}{p} + \frac{M_c}{p} + \frac{D^t}{p} \quad (6.4)$$

The bank behavior is completely described by the following system of eleven equations determining eleven endogenous variables.

$$\frac{B}{p} = \frac{R}{p} + \frac{M_c}{p} \quad \text{uses of the monetary base} \quad (6.5)$$

$$\frac{\bar{B}^a}{p} = \frac{B}{p} - \frac{A}{p} \quad \text{the adjusted monetary base} \quad (6.6)$$

$$\frac{M}{p} = \frac{D_p^s}{p} + \frac{M_c}{p} + \frac{D^t}{p} \quad \text{the money supply} \quad (6.7)$$

$$\frac{E}{p} = \frac{D_p^s}{p} + \frac{D^t}{p} + \frac{D_g^s}{p} + \frac{A}{p} - \frac{R}{p} \quad \text{earning assets of commercial banks} \quad (6.8)$$

$$\frac{R}{p} = \frac{R_r}{p} + \frac{R_e}{p} \quad \text{allocation of total reserves} \quad (6.9)$$

$$\frac{R_r}{p} = \bar{r}^d \left( \frac{D_p^s}{p} + \frac{D_g^s}{p} \right) + \bar{r}^t \frac{D^t}{p} \quad \text{required reserves} \quad (6.10)$$

$$\frac{R_e}{p} = e[i, i^t(i), \bar{p}, \bar{r}^d, \bar{r}^t] \left( \frac{D_p^s}{p} + \frac{D_g^s}{p} + \frac{D^t}{p} \right) \quad \text{excess reserves} \quad (6.11)$$

$$e_1 < 0; e_2? < 0; e_3 > 0; e_4? < 0; e_5? < 0$$

$$\frac{A}{p} = b[i, i^t(i), \bar{p}, \bar{r}^d, \bar{r}^t] \left( \frac{D_p^s}{p} + \frac{D_g^s}{p} + \frac{D^t}{p} \right) \quad \text{commercial bank borrowings} \quad (6.12)$$

$$b_1 > 0, b_2? > 0, b_3 < 0, b_4? > 0, b_5? > 0$$

$$\frac{M_c}{p} = k \left( \frac{W_o}{p}, \frac{\bar{T}}{p} \right) \frac{D_p^s}{p} \quad \text{allocation ratio} \quad (6.13)$$

$$k_1? < 0, k_2? < 0$$

$$\frac{D^t}{p} = t \left( \frac{W_o}{p}, Y, i, i^*(i); R^e \right) \frac{D_p^s}{p} \quad \text{allocation ratio} \quad (6.14)$$

$$t_1 > 0, t_2? > 0, t_3 < 0, t_4 > 0$$

$$\frac{D_g^s}{p} = d \frac{D_p^s}{p} \quad \text{government behavior} \quad (6.15)$$

If we fix  $i, p, Y$  and thereby  $W_o$  in addition to the policy parameters,  $\bar{T}, \bar{B}^a, \bar{r}^d, \bar{r}^t, \bar{p}$ ,  $\bar{d}$ , we are left with eleven linear equations in eleven endogenous variables:

$$\bar{p}, \bar{p}, \bar{p}, \bar{p}, \bar{p}, \bar{p}, \bar{p}, \bar{p}, \bar{p}, \bar{p}, \bar{p}$$

From these equations we derive the money multiplier defined as follows:

$$\frac{M}{\bar{p}} = \frac{1 + t + k}{e(1+t+d) + \bar{r}^d(1+d) + t \bar{r}^t - b(1+t+d) + k \bar{p}} \bar{B}^a \quad (6.16)$$

using the definition

$$r = \frac{1+d}{1+t+d} \bar{r}^d + \frac{t}{1+t+d} \bar{r}^t + e$$

we arrive at the basic Brunner-Meltzer equation

$$\frac{M}{\bar{p}} = \frac{1 + t + k}{(r-b)(1+t+d) + k} \frac{\bar{B}^a}{\bar{p}}, \text{ for } r > b \quad (6.17)$$

Again, we recall that we use the money definition in the broader sense including time deposits.

To derive a demand function for adjusted base money, we need some further relations:

$$\frac{A}{\bar{p}} = \frac{b(1+t+d)}{(r-b)(1+t+d) + k} \frac{\bar{B}^a}{\bar{p}}; \frac{D_p^s}{\bar{p}} + \frac{D^t}{\bar{p}} = \frac{1+t}{(r-b)(1+t+d) + k} \frac{B^a}{\bar{p}} \quad (6.18)-(6.19)$$

$$\frac{R}{\bar{p}} = \frac{(1+d)(\bar{r}^d + e) + t(\bar{r}^t + e)}{(r-b)(1+t+d) + k} \frac{\bar{B}^a}{\bar{p}}; \frac{D_g^s}{\bar{p}} = \frac{d}{(r-b)(1+t+d) + k} \frac{\bar{B}^a}{\bar{p}} \quad (6.20)-(6.21)$$

We proceed by restating our basic equations left:

$$\frac{W_o}{\bar{p}} = \frac{\lambda Y}{i} + \frac{\bar{N}_o}{\bar{p}i} + \frac{B_o^a}{\bar{p}} - \frac{d}{(r-b)(1+t+d) + k} \frac{\bar{B}_o^a}{\bar{p}} - \frac{\xi \bar{T}}{\bar{p}i} \quad \text{wealth definition} \quad (6.22)$$

$$Y = C(Y + \frac{\bar{N}_o}{\bar{p}} - \frac{\bar{T}}{\bar{p}}) + I(i) + \frac{\bar{G}}{\bar{p}} \quad \text{commodity market equilibrium} \quad (6.23)$$

$$\frac{\bar{B}_1^a}{\bar{p}} = \frac{\bar{B}_0^a}{\bar{p}} = \frac{(1+d)(\bar{r}^d + e) + t(\bar{r}^t + e)}{(r-b)(1+t+d) + k} \frac{\bar{B}_1^a}{\bar{p}} + m\left(\frac{W_0}{\bar{p}}, Y, i, i^*(i); R^e\right) \quad (6.24)$$

$$- \frac{1+t}{(r-b)(1+t+d)} \frac{\bar{B}_1}{\bar{p}} - \frac{b(1+t+d)}{(r-b)(1+t+d)} \frac{\bar{B}_1}{\bar{p}} \quad \text{market equilibrium for adjusted base money, resp.}$$

$$\frac{1+t+k}{(r-b)(1+t+d) + k} \frac{\bar{B}_1^a}{\bar{p}} = m\left(\frac{W_0}{\bar{p}}, Y, i, i^*(i); R^e\right) \quad \text{money market equilibrium} \quad (6.25)$$

If we use either the market equilibrium condition for adjusted base money or the money market equilibrium condition for money, we are left with three equations in three unknown variables,  $\frac{W_0}{\bar{p}}$ ,  $Y$  and  $i$ . To complete the multiplier expressions, we

have to substitute the above defined quotient functions.

Because the formal analysis is completely analogous to our previous derivations, there is no reason to go into the technical details. Because the IS curve can be derived in the familiar way, there is no change of the structure of the underlying transmission mechanism. We could use either the equilibrium condition for adjusted base money or for money defined in the broader sense to derive an LM curve. On the other side, we could solve the first two equations for real income and define a modified wealth restriction. In this case the diagrammatical device developed in the last section could be used to focus on the money market. Once more we could rely on either of the remaining equations to solve for the interest rate.

To include a government budget restraint together with the saving-investment process, we have to relate the demand for adjusted base money to the end of the period, assuming instantaneous adjustment of the banking sector.

We should note that the demand and supply functions for earning assets are residuals provided for by Walras' law. Neither equation imposes any restriction on the remaining equation system. Consistent with the Keynesian approach, we introduced the market equivalents for real capital  $\frac{\lambda Y}{i}$ , government bonds  $\frac{N_0}{pi}$ , the present value of future tax payments  $\frac{\xi T}{p}$  and bank earning assets  $\frac{E}{p}$  as homogeneous goods, represen-

tatives of the class of long-term interest bearing claims. This is certainly an ultra-Keynesian approach which gives some hints on how to reformulate and reconstruct the Keynesian model, namely by incorporating both an independent market for real capital and an independent market for bank credit. The relative prices determined on these markets will enter all the expenditure functions, which really modifies and extends the narrow Keynesian conception of the transmission mechanism.

*List of Symbols*

|         |                                                                                                           |
|---------|-----------------------------------------------------------------------------------------------------------|
| A       | discounts and advances in nominal terms                                                                   |
| B       | monetary base in nominal terms: $R + M_c$                                                                 |
| $B^a$   | adjusted monetary base in nominal terms: $B - A$                                                          |
| C       | real expenditure for final output of consumers, resp. output of consumption goods in the two-sector model |
| $C^g$   | nominal expenditure for consumption goods of the government                                               |
| $C^p$   | real expenditure for consumption goods of consumers                                                       |
| $D_g^s$ | demand deposits of the government in nominal terms                                                        |
| $D_p^s$ | demand deposits of the public in nominal terms                                                            |
| $D^t$   | time deposits in nominal terms                                                                            |
| G       | nominal expenditure for final output of the government                                                    |
| I       | real expenditure for final output of investors, resp. output of investment goods in the two-sector model  |
| $I^c$   | real expenditure for investment goods of the consumption goods industry                                   |
| $I^g$   | nominal expenditure for investment goods of the government                                                |
| $I^i$   | real expenditure for investment goods of the investment goods industry                                    |
| i       | market interest rate: nominal rate equal to real rate                                                     |
| $i^t$   | interest rate on time deposits                                                                            |
|         | earning assets of commercial banks net of capital accounts in nominal terms                               |
| K       | total physical capital stock                                                                              |
| $K^c$   | capital stock of the consumption goods industry                                                           |
| $K^i$   | capital stock of the investment goods industry                                                            |
| L       | total labor input                                                                                         |
| $L^c$   | labor input in the consumption goods industry                                                             |
| $L^i$   | labor input in the investment goods industry                                                              |
| M       | nominal money stock                                                                                       |
| $m_c$   | currency held by the public in nominal terms                                                              |
| N       | number of standard bonds promising to pay a unit of money per period of time                              |
| p       | absolute price level, resp. price of consumption goods in the two-sector model                            |
| q       | price of investment goods                                                                                 |
| R       | total commercial bank reserves in nominal terms                                                           |
| $R^e$   | vector describing the individual expected interest rates                                                  |
| $R_e$   | excess reserves in nominal terms                                                                          |
| $R_r$   | required reserves in nominal terms                                                                        |
| $r^d$   | reserve-requirement ratio for demand deposits                                                             |
| $r^t$   | reserve-requirement ratio for time-deposits                                                               |
| T       | nominal tax payments                                                                                      |
| $V^d$   | real net demand for interest bearing claims                                                               |
| W       | total nominal wealth of the private sector                                                                |
| w       | nominal wage rate                                                                                         |
| Y       | real gross national product                                                                               |
| $\phi$  | autonomous investment                                                                                     |

|           |                                                                |
|-----------|----------------------------------------------------------------|
| $\lambda$ | distribution parameter                                         |
| $\rho$    | discount rate                                                  |
| $\xi$     | tax capitalization parameter                                   |
| $\tau$    | time operator (equal to one divided by the unit time interval) |

## Notes

<sup>1</sup> See James Tobin, "Money, Capital and Other Stores of Value", *American Economic Review*, Vol. 51, May 1961, pp. 26–37.

<sup>2</sup> If we follow Axel Leijonhufvud's interpretation in his book "On Keynesian Economics and the Economics of Keynes", New York 1968, we have to accept his main thesis that Keynesian economics are quite distinct from Keynes' own theory. Keynes' own efforts were always directed towards a reformulation of inherited price theory which failed its major test during the Great Depression. The usual Keynesian theory, however, generally de-emphasizes the role of relative prices both in the specification of the mechanism transmitting monetary impulses and in the explanation of inflexibilities and rigidities in the economic system.

<sup>3</sup> Compare for instance Martin J. Baily, "National Income and the Price Level: A Study in Macrotheory", New York 1962.

<sup>4</sup> Given the money stock, the "crowding out effect" on private investment expenditures could at most be equal to the change in government expenditure, a situation unlikely to occur.

<sup>5</sup> Axel Leijonhufvud, "On Keynesian Economics and the Economics of Keynes", *loc. cit.*, pp. 6–8.

<sup>6</sup> The last statement paraphrases Milton Friedman's procedure. See his "A Theoretical Framework for Monetary Analysis", *Journal of Political Economy*, Vol. 78, 1970, pp. 193–238. A similar approach is taken by David Fand, "Keynesian Monetary Theories, Stabilization Policy, and the Recent Inflation", *Journal of Money, Credit and Banking*, Vol. 1, 1969, pp. 556–587.

<sup>7</sup> This should by no means suggest that this current controversy can be settled in the context of the simple Keynesian model. Both factions rely on completely different "visions" when answering the question how the economy operates at large.

<sup>8</sup> A change in real income could be related to a shift of the production function or to a change in the labor market conditions. To simplify, we ignore the induced feedbacks on the demand for new capital.

<sup>9</sup> We demonstrate in section 4 that these results are still valid when we explicitly include a government budget restraint.

<sup>10</sup> The backward bending part of the aggregate supply is only drawn for illustrative purposes. This part corresponds to a complicated dynamic process which would eventually change the underlying behavior functions. For some of the implications see Don Patinkin, "Money, Interest, and Prices", New York 1965, pp. 313–324.

<sup>11</sup> For a formal development of this aspect compare Björn Thalberg, "A Keynesian Model Extended by Explicit Demand and Supply Functions for Investment Goods", Uppsala 1962, and Peer M. Wijkman, "The Marginal Efficiency of Capital and Investment: A Didactic Exercise", *Swedish Journal of Economics*, Vol. 63, 1965, pp. 263–277. Wijkman's didactic exercise gives a good presentation of the two concepts, but contains at the same time some confusing mathematical errors. Thalberg's book was very useful for the derivation of our foundation of the investment demand of the two industries.

<sup>12</sup> See for instance Paul A. Samuelson, "Foundations of Economic Analysis", Cambridge, Mass. 1947, pp. 160–163.

<sup>13</sup> Arthur M. Okun, "The Political Economy of Prosperity", New York 1969.

<sup>14</sup> The standard reference in this context is of course Lloyd A. Metzler, "Wealth, Saving, and the Rate of Interest", *Journal of Political Economy*, Vol. 59, 1951, pp. 93–110.

<sup>15</sup> For a further discussion compare Hans G. Monissen, "Including a Government Budget Restraint in Standard Macroeconomic Analysis: Some Fiscal and Monetary Policy Implications", to be published in Finanzarchiv.

<sup>16</sup> The term "period" is used as a theoretical term analogously to the Hicksian "week" as applied for instance in Don Patinkin, *Money, Interest, and Prices*, *loc. cit. passim*. Our analysis thus describes a one-period equilibrium.

<sup>17</sup> For a detailed analysis of the micro- and macro-implications of the Keynesian approach to portfolio behavior compare Hans G. Monissen, "Analyse der Keynesianischen Liquiditätspräferenzfunktion", *Kredit und Kapital*, 4. Jahrgang, 1971, pp. 27–56.

<sup>18</sup> See for instance Karl Brunner and Allan H. Meltzer, "Liquidity Traps for Money, Bank Credit, and Interest Rates", *Journal of Political Economy*, Vol. 76, 1968, pp. 1–37.

## *Some Theoretical Issues in Keynesian Stabilization Policy*

### Summary

After reviewing several versions of the standard Keynesian model, the basic system is extended by including independent demand and supply functions for both consumption and investment goods. The interplay of the relative output prices changes and modifies some of the major Keynesian policy implications, especially those bearing on the effects of fiscal policy operations and the reliability of the interest rate as a monetary indicator. It is then shown that a government budget restraint can be incorporated into the basic model without changing any of the derived policy conclusions. The paper continues with a comparison of the effects of different monetary and fiscal policy operations in the context of a derived portfolio model. Some suggestions for including the money supply process complete the discussion.

## *Einige theoretische Ergebnisse zur keynesianischen Stabilitätspolitik*

### Zusammenfassung

Nach einer kurzen Diskussion verschiedener Versionen des Keynesianischen Standardmodells, wird das Grundsystem durch die Einbeziehung unabhängiger Nachfragefunktionen für Konsum- sowie für Investitionsgüter erweitert. Das Zusammenspiel der relativen Outputpreise verändert und modifiziert einige der wesentlichen Keynesianischen Politikimplikationen, insbesondere jene, die sich auf die Wirkung der Fiskaloperationen und die Verlässlichkeit der Zinsrate als Indikator für die Geldpolitik beziehen. Es wird dann gezeigt, dass eine Budgetrestriktion für den Staat eingeführt werden kann, ohne dass dadurch irgendeines der abgeleiteten Ergebnisse geändert werden müsste. Daran knüpft ein Vergleich der Wirkungen verschiedener geld- und fiskalpolitischer Massnahmen im Rahmen eines abgeleiteten Portfoliomodells an. Die Diskussion schliesst mit einigen Vorschlägen, den Geldangebotsprozess in den Zusammenhang einzubeziehen.

*Quelques conclusions théorétiques sur la politique de stabilité keynésienne***Résumé**

Après une brève discussion des différentes versions du modèle keynésien standardisé, le système de base est élargi grâce à l'introduction de fonctions indépendantes de demande pour les biens de consommation et d'investissement. L'interaction des prix relatifs à la production entraîne la variation et la modification de certaines implications importantes de politique économique keynésienne, en particulier de celles qui se rapportent à l'effet des opérations fiscales et à la fiabilité du taux d'intérêt en tout qu'indicateur de la politique monétaire. On montre alors qu'on peut introduire une contrainte budgétaire pour l'état, sans devoir modifier aucun des résultats dérivés. S'y rattache une comparaison des effets de différences mesures de politique monétaire et fiscale dans le cadre d'un modèle de portefeuille. La discussion se conclut par quelques propositions concernant l'introduction dans cet ensemble du processus d'offre de monnaie.