Mr. Hicks and the "Monetarists"

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Mr. Hicks and the "Monetarists"

By KARL BRUNNER and ALLAN H. MELTZER[1]

It is a great privilege to open a conference in honour of Sir John Hicks. Among his many contributions to economics, none has been more influential than his interpretation and restatement of Keynesian theory in "Mr. Keynes and the 'Classics'". So many text-books and articles have adopted the framework, first presented in that paper, that it has become the standard statement of macro-economic theory. Few dispute its place. Restatements, amendments and modifications have neither obliterated the main features of Hicks's presentation nor successfully altered many of the main propositions.

Our large debt to Professor Hicks becomes apparent when we realize that, notwithstanding the central place of his statement of macro-theory, neither Hicks nor we, his fellow economists, would choose this influential paper as Hicks's main contribution to economics.

Having praised the important role of the Hicksian framework as a major step in the development of macro-theory, it is proper to emphasize that the graphical apparatus received far more attention than the relative price theory it was intended to summarize. To Hicks, classical theory was a theory of relative prices according to which differences in the marginal cost of production and in the relative prices of consumption and investment goods determined the allocation of homogeneous labour and, in the short run, determined the level of employment. He regarded Keynes's description of classical economics as "quite as strange and novel as the doctrines of Mr. Keynes himself" ([2], p. 147). With the advantage of 35 years of hindsight, we know that it is the "strange and novel" interpretation that prevailed.

It seems appropriate to begin this conference by acknowledging the very important contribution that Hicks made in synthesizing Keynesian and classical theory. Without a framework of the type he provided, many of the issues now comfortably settled might well remain in dispute.

It is also appropriate to count the costs, a generation later, of retaining the synthesis. A main point of some current monetarist critiques of macro-economic theory is that a new framework is required to analyse the effects of relative prices and changes in relative prices. Monetarists emphasize the difference between market rates and real rates, between prices of current consumables and the prices of assets used to produce current and future income, between current prices and money wages and anticipated future prices and wages. All of these distinctions are mentioned by Hicks; until recently, none has held a

[1] We are indebted to the National Science Foundation for continued support.
References in square brackets are listed on p. 59, below.

dominant or even important role in the many restatements and adaptations of his paper.

There are additional problems in the Hicksian synthesis. Bonds and real capital are assumed to be perfect substitutes. The effects on relative prices, output and the price level of the financing of a government surplus or deficit are omitted or obscured. The relative strengths of fiscal and monetary policy depend only on the slopes of the demand function for money and the expenditure function. The speed of adjustment to fiscal policy is independent of the means by which the budget deficit or surplus is financed. The effect of fiscal policy is related to the full-employment budget or the national-income deficit and is independent of the amounts financed by issuing government debt and base money. Either there is only one solution for prices and output, the full-employment solution with stable prices, or there are inflationary and deflationary solutions in which all market participants share the same anticipations.

In this paper, we compare the amended Hicksian synthesis to an emerging monetarist framework. To keep the discussion focused on some main differences, we restrict attention to the consequences of a maintained increase in government expenditure in a closed economy of the type analysed by Hicks [2] and Keynes [3]. The capital stock is fixed. All real demand equations are homogeneous of zero degree in prices and the value of financial assets. Own price elasticities of demand are negative and cross elasticities are positive.

I. The Amended Hicks Synthesis

Hicks's synthesis of Keynesian and classical theory is too well known to require detailed explanation. A basic postulate is that the output market equations can be solved for equilibrium values of nominal income and market interest rates. The equilibrium solution for the output market is the *IS* curve and is given by

$$I(i, Y)-S(i, Y)=0,$$

where Y is nominal income and i is the market rate of interest. The nominal stock of money, M, must be willingly held. The *LM* curve, or *LL* curve in Hicks's version, shows the equilibrium position of the monetary sector. The curve is given by

$$M=L(i, Y).$$

Together, *IS* and *LM* determine a unique level of nominal income and a market rate of interest. Hicks explicitly takes the real rate as the rate determined by the intersection of *IS* and *LM*. He adds that, in inflation, the *IS* curve may be horizontal to the left of full-employment output. More likely, "the rise in the (money) wage level may create a presumption that wages will rise again later on; if so, . . . *IS* will be upward sloping" ([2], p. 158). The upward slope of *IS* he attributes to expectations of inflation that raise the marginal propensity to invest until it

exceeds the marginal propensity to save out of nominal income. With the positively sloped *LM* curve, market rates and real rates then rise together (*Idem.*).

Five main changes have amended the Hicksian synthesis. Whether these changes are faithful to the intentions of Hicks and Keynes, we leave others to decide. For our purposes, it is enough that the changes capture much of what is said by contemporary economists.

First, a single, aggregate production function replaces the two production sectors summarized by Hicks's labour market equations. The aggregate production function

$$(1) \qquad y=f(K, N); \quad f_1, f_2>0$$

relates the output produced at some point on an efficient frontier, y, to the inputs of capital, K, and labour, N. With capital stock, productivity and tastes given and with anticipations equal to actual values, the constant population supplies the man-hours of labour, $N=N_0$, consistent with their lifetime consumption plans and the current and anticipated prices. Real output is y_0. For real output to exceed y_0, man-hours of labour must exceed N_0. Whether this can occur, other than as a temporary and unsustainable departure from equilibrium, is currently the central point in a dispute about the shape of long-run Phillips curves.

A second, main change in the Hicksian synthesis is the introduction of a short-run Phillips-type curve relating current output and employment to the rate of price or wage change ([5], 1958). The shape of this curve and the arguments of the function are unsettled issues. For convenience, Eq. (2) relates the current rate of price change, dp/p, to the difference between current and long-run real output, $y-y_0$, and the anticipated rate of inflation, π. Our choice of variables has the advantage of making the long-run rate of inflation depend on the anticipated rate of inflation while allowing short- and long-run rates of inflation to differ. The consequences of this choice will concern us when we analyse the effects of a change in government expenditure below.[1]

$$(2) \qquad dp/p=h(y-y_0, \pi); \quad h_1, h_2>0.$$

The third and fourth changes alter the expenditure and money functions. Real output replaces nominal output in both functions, and the real rate of interest, $i-\pi$, replaces the market rate in the expenditure function. Most economists now add a real balance effect, M/p, in the expenditure function, and we have added g, the real value of government expenditure, to make the government's role explicit. With these changes, Eq. (3) replaces Hicks's *IS* curve, and (4) replaces the *LM* curve:

$$(3) \qquad E(i-\pi, y, M/p, g)=y; \qquad E_1<0; \qquad E_2, E_3, E_4>0;$$

$$(4) \qquad L(i, y)=M/p; \qquad L_1<0; \qquad L_2>0.$$

[1] The long-run anticipated rate of inflation depends on policy variables, and the *h*-function must be restricted to permit this dependence to remain as an implication of the model.

The fifth change adds an equilibrium condition that is required once real rates and market rates are allowed to diverge. In equilibrium, the actual and anticipated rate of price change, π, must be equal:[1]

(5) $\pi = dp/p.$

For given tastes, resources, productivity and anticipations and a fixed quantity of money, Eqs. (1) to (4) determine y_0, y, dp/p and i. The current price level, the real rate of interest and the values of real balances and real expenditure can then be obtained. The economy can maintain a deficit or surplus each period, or the budget can be balanced. Let t be the nominal value of tax collections; $pg - t = dM$ describes the government's budget position and the financing of any deficit or surplus. The model implies that to sustain equilibrium π must equal dM/M.

Figure 1 shows the principal relations. Eqs. (1), (3) and (4) are in the upper panel; (1) and (2) are in the lower panel. An initial position of equilibrium is at $y = y_0$, i_0 and $\frac{dp}{p}_0$. All markets have adjusted to the fully-anticipated rate of price change; so Eq. (5) is satisfied also. It is useful to refer to this position as "full employment". Since capital and techniques of production are fixed, N_0 is the number of man-hours of labour demanded and supplied at full employment.

What can be said about employment and output in excess of N_0 and y_0? What happens to prices, interest rates, the rate of inflation and the productivity of capital and labour? The answers to several of the questions given by the amended Hicks model depend very much on assumptions about the long-run Phillips curve, and particularly on the effect of anticipations on the actual rate of price change.

Suppose the government increases real expenditure and finances the entire deficit by issuing money. There is an excess demand for real output and an excess supply of money, so expenditure rises to E_1 and money balances rise to L_1. The Hicksian economy reaches short-run equilibrium at the intersection of the curves labelled E_1 and L_1. Real output, y_1, now exceeds full-employment output, y_0. If the anticipated rate of inflation remains unchanged, the economy moves along the solid Phillips curve, h_0, and the rate of inflation rises. Wages and prices rise; employment exceeds $N = N_0$.

If higher prices give rise to anticipations of an increase in the rate of price change, the Phillips curve in Figure 1 shifts to h_1, and the actual rate of inflation increases. The combined effects of higher prices and price anticipations on real expenditure and real balances is shown as a decline in output from y_1 to y_2, a reduction in real expenditure to E_2 and in money balances to L_0. The rate of price change, now $\frac{dp}{p}_1$, is above the rate required to maintain long-run equilibrium.

[1] Some might wish to add an equation explaining the anticipated rate of price change in terms of past rates of change. We do not discuss the process by which anticipations form or decay.

The change in g has a once-and-for-all effect; but the effects of financing the deficit continue as long as the budget deficit continues. Long-run equilibrium is reached at the intersection of E_3, L_2 and y_0. Anticipated and actual rates of inflation are equal to the rate of monetary expansion, and the latter depends on the size of the maintained

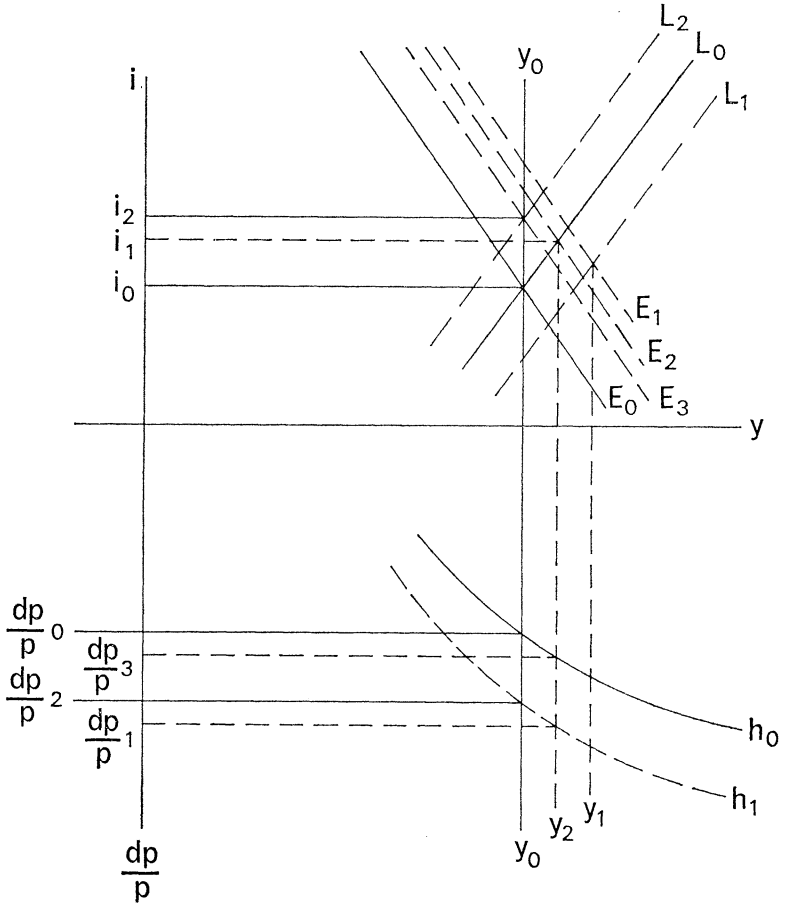

FIGURE 1

deficit. Market interest rates rise by more than the change in the fully-anticipated rate of inflation, $\frac{dp}{p}_2 - \frac{dp}{p}_0$, and real rates are higher than in the initial equilibrium; so $i_2 > i_0 + \frac{dp}{p}_2 - \frac{dp}{p}_0$.

The long-run effects of an increase in g financed by issuing debt depend on the assumptions made about the discounting of future tax liabilities and the extent to which bonds and real capital are substitutes.

Although the amended Hicksian model is generally silent on the effects of increases in the stock of debt, several cases can be distinguished. Most common is to assume that bonds are a perfect substitute for real capital. In this case, issuing debt is equivalent to redistributing ownership of the fixed capital stock between the government and the private sector.[1] The maintained increase in government expenditure is matched by a maintained increase in the present value of tax liabilities that just equals the increase in debt. The financing of the deficit has no independent effect on the outcome. Long-run equilibrium output and the equilibrium rate of inflation are the same as the initial output and rate of inflation, y_0 and $\frac{dp}{p}_0$ in Figure 1. Interest rates are higher, and real balances are lower in the new equilibrium. Eventually, the public owns the entire capital stock; thereafter, either the budget must be balanced or money must be issued.

If bonds are perfect substitutes for real capital but future tax liabilities are not fully discounted, issuing debt increases wealth by a fraction of the increase in debt. To absorb the debt in portfolios, interest rates rise above the level achieved in the previous case. Equilibrium output remains at y_0.

The amended Hicksian model is not a useful framework for analysing a maintained increase in the deficit when real capital and bonds are not perfect substitutes and future tax liabilities are not fully discounted. The reason is that there are now three distinct assets—money, bonds and real capital—one more than the model can accommodate.

The amended Hicksian model yields the conclusions that, in long-run equilibrium, employment cannot exceed N_0 and output cannot exceed y_0. Some economists do not accept these conclusions.[2] Many of their arguments can be reduced to one or at most two propositions. Either they deny that the Phillips curve, Eq. (2), depends on the anticipated rate of price (or wage) change, or they deny that anticipated and actual rates of price (or wage) changes are equal in equilibrium.

Some sets of assumptions about the formation of anticipations and their effect leave the economy with a rate of inflation such as $\frac{dp}{p}_1$ in Figure 1. Actual inflation exceeds the anticipated rate of inflation, $\pi=\frac{dp}{p}_2$, that determines the position of the h_1 curve. Employment, N, exceeds N_0. Failure to anticipate correctly and adjust to inflation leaves output at y_2 and market rates at i_1.

If market participants correctly anticipated the rate of inflation, out-

[1] The government can make transfer payments and acquire or dispose of real capital as in Metzler's classic article [4]. The amount of government debt issued is, therefore, limited, and the government cannot run a permanent deficit and finance it by issuing debt (selling real capital). This is a consequence of neglecting the credit market.

[2] Tobin [6] discusses many of the standard reasons and introduces a new one.

put would decline to y_0. There are two reasons. First, at y_2, output is higher than in the initial equilibrium, and capital stock is unchanged. The marginal product of capital has increased. In equilibrium, the marginal product of capital must equal the anticipated return, $i_1-\pi$; both now exceed the actual return, $i_1-\frac{dp}{p}_1$. As long as the returns received by holders of capital are less than anticipated, capital will be sold. Hence, at y_2, i_1, $\frac{dp}{p}_1$, there is an excess supply of capital. Second, the opportunity cost of holding money exceeds the market rate of interest by the difference between the actual and the anticipated rate of inflation. Holders of money attempt to spend more, thereby raising prices and interest rates. The position described by i_1, y_2 $\frac{dp}{p}_1$ cannot be an equilibrium in the Hicksian economy. Prices and interest rates rise until equilibrium is restored.

There is as yet no careful analysis showing why the adjustment of asset and output markets fails to restore full employment at $y=y_0$, with $N=N_0$, and $\pi=dp/p$. Moreover, failure to adjust to equilibrium at y_0 can provide no more than a one-time increase in output and employment. Each additional increase in employment requires an increase in the excess of actual over anticipated rates of price change, an ever-widening gap between anticipated and actual returns to real capital and an ever-increasing disequilibrium. Since bonds and real capital are perfect substitutes in the Hicksian model, this method of steadily-increasing employment, if it could be used, provides for the "euthanasia of the rentier" and also eliminates the owner of real capital. There is no obvious benefit to workers or to society from a policy of reducing capital per man or per man hour. Nor is there evidence suggesting that realized returns to real capital fall below anticipated returns during periods of expansion and high employment.

An alternative that is discussed more frequently has several features in common with the previous model but differs in one main respect. The Phillips curve is said to be independent of changes in anticipated inflation. Suppose the Phillips curve is stable at h_0 in Figure 1. If expenditure is at E_2 and money at L_0, output is y_2 and the rate of inflation is $\frac{dp}{p}_3$. Let this rate be fully anticipated by asset owners, so that the market interest rate i_1 equals $i_0+\frac{dp}{p}_3$.

Is the position of the economy at y_2, i_1, $\frac{dp}{p}_3$ a sustainable position of equilibrium? The answer given by the amended Hicks synthesis must be negative. The position of the Phillips curve at h_0 shows that producers have failed to adjust to the anticipated rate of inflation. Real wages must fall to equality with the (lower) marginal product of labour if real

profits are to rise to equality with the increased marginal product of capital. If money wages rise at the same rate as the prices of output, real wages exceed the marginal product of labour, and real returns to capital are less than the marginal product of capital. Either real wages fall, or real profits are insufficient to maintain portfolio equilibrium. The first alternative is inconsistent with available evidence on wage changes, for example, series showing unit labour costs during inflation. The second is inconsistent with the previous assumption that anticipated returns to capital are equal and higher than before the inflation.

We do not deny that workers can increase employment by reducing real wages, but we doubt that there is evidence showing that recent inflations are accompanied by a reduction of real wages or by a failure of money wages to adjust to inflation. Recent discussions of wage–price policies—and the policies themselves—have been predicted on an opposing view. We know of no evidence showing that real wages are reduced in periods of expansion and inflation.

A third alternative is to follow Hicks [2] and Wicksell [7]. Anticipation of increased real returns to capital reverses the slope of the E-function; the E-function now slopes positively but is flatter than the L-function. An increase in government expenditure raises output. Anticipated real rates rise with market rates; the marginal product of capital and the rate of inflation increase.

The realized return, $i-dp/p$, may remain equal to the marginal product of capital in this case; but if so, there is a gap between anticipated returns to real capital and the marginal product of capital. The gap can be removed by an increase in the anticipated rate of inflation, a shift of the Phillips curve, and a decline in real money balances that puts the economy into an equilibrium at $y=y_0$.

II. A Monetarist Framework

Several implications of the amended Hicksian model are inconsistent or incorrect. Actual and anticipated rates of price change diverge, but at any time there is a single, universally shared, anticipated rate of inflation. There are costs of acquiring information and, consequently, unanticipated changes in the rate of inflation can occur. When inflation occurs, asset owners shift from money to bonds or real capital. There are, however, no shifts between bonds and real capital; these assets are perfect substitutes, so bond prices adjust costlessly and instantaneously to changes in the rate of inflation. Here, there are no costs of acquiring information. Producers and purchasers do not forecast correctly the rate of price change, but they are able to forecast correctly their future tax liabilities (in a multiple tax system). Consequently, issuing debt to finance a government deficit has no independent effect. The entire effect is the effect of the deficit on expenditure.

These and other problems suggest that the Hicksian model has been patched up to take into account some costs of acquiring information

but has not been revised to give full recognition to these costs. An alternative model—the monetarist model—more fully incorporating many of the changes required to take account of cost of information has emerged in recent years. This section presents a condensed version of the model and uses it to analyse the effect of a change in government expenditure.[1]

There are several main differences. First, purchasers and producers hold anticipations about future price levels. Their anticipations are not identical, and both may differ from prevailing prices. Consequently, the output market is not always cleared; real expenditure may exceed, or fall short of, real output. Second, the present value of interest payments on government securities is not identical to the discounted stream of future tax liabilities. The movements of interest rates and asset prices can diverge, and asset owners can choose to hold money or bonds or real capital. However, markets for nominal assets are in equilibrium at prevailing prices, anticipations and interest rates. Third, government securities are not perfect substitutes for real capital. Issuing or retiring government debt, to finance a budget deficit or surplus, changes the composition of real wealth and, therefore, changes the prices of assets and output.

In one way or another, the three differences we have emphasized reflect costs of acquiring information and adjusting to new information. However, unlike the amended Hicksian model, producers do not form anticipations about the rate at which prices change, but about future price levels. Producers increase inventories and reduce current sales if they anticipate higher prices. Purchasers also form anticipations about future prices and increase current purchases if they anticipate higher future prices. In equilibrium, purchasers and producers hold the same anticipations and the implied rate of inflation must equal the actual rate of price change.

To facilitate comparison, we number the equations of the monetarist framework to correspond to their closest analogue in the amended Hicksian model. The same symbols are used.

Eq. (1a) is a price-setting function.

$$(1a) \qquad p=p(y, \phi, K); \quad p_1, p_2>0; \quad p_3<0.$$

The variables p, y and K are, as before, output prices, current output and the fixed stock of real capital; ϕ is the producers' anticipations of future prices.

There is no explicit Phillips curve directly linking the rate of price change to excess demand, to anticipations or to unemployment. The phenomenon that the Phillips curve attempts to capture—the relation between the adjustment of output and employment on one side and prices or wages on the other—is an implication, not an assumption. There is no reason to expect a stable, consistent relation between the

[1] Several parts of the framework presented here are developed more fully in Brunner and Meltzer [1]. Price anticipations are introduced here.

rate of price change and a few key variables. On the contrary, our hypothesis makes the "trade-off between inflation and employment" depend on the relative speeds of adjustment of producers and purchasers to new information affecting the general price level. The more rapid the producers' speed of adjustment relative to the purchasers' adjustment, the smaller the "trade-off".

A key relation of the monetarist hypothesis summarizes the adjustment process on the output market. Real output adjusts to aggregate excess demand. In Eq. (2a), D is aggregate real expenditure of the private and government sectors:

$$\text{(2a)} \qquad \frac{d(\log y)}{dt} = h(\log D - \log y).$$

Since the output market is not always in equilibrium, there is no analogue to the *IS* curve. Eq. (2a) is the expenditure function:

$$\text{(3a)} \qquad D = D(p, p^*, P, i-\pi, y, g); \quad D_1, D_4 < 0; \quad D_2, D_3, D_5, D_6 > 0.$$

Two new variables are introduced; P is the money price of existing real capital, and p^* is the purchasers' anticipated price level.

There is also no simple analogue to the *LM* curve. The market value of wealth consists of money, bonds and capital at current prices. The real capital stock is fixed, and there are two equations to (proximately) determine two asset prices. On the money market, the demand and supply equations for nominal money balances (proximately) determine P. The stock of money depends on the decisions of banks and the public, expressed by the monetary multiplier, m, and on the monetary base, B. The demand for nominal money balances depends on current and anticipated future prices:

$$\text{(4a)} \qquad m(i, P, y)B = L(i, P, y, p, p^*, \phi); \quad m_1 > 0; \quad m_2, m_3 < 0; \quad \text{and } L_1, L_5, L_6 < 0; \quad L_2, L_3, L_4 > 0.$$

Each individual chooses his desired net indebtedness by borrowing from banks and by buying or selling government securities. As a result of these decisions, the stock of outstanding government securities is distributed between banks and the public, and the market rate of interest is (proximately) determined. The bank-credit market is the name given to the market on which these transactions occur. The nominal stock of bank-credit, aB, is the product of a credit multiplier and the base. The stock of bank-credit equals the earning assets of the banks, loans plus government securities.

$$\text{(4b)} \qquad a(i, P, y)B = \sigma(i-\pi, P, y, p, p^*, \phi, S); \quad a_1, a_2, a_3 > 0, \quad \text{and } \sigma_1, \sigma_2 < 0; \quad \sigma_3, \ldots, \sigma_7 > 0.$$

There are now three types of anticipation, p^*, ϕ and π. In equilibrium, the three must be consistent. This requires that producers, purchasers and assets owners hold identical anticipations.

$$\text{(5a)} \qquad p^*/p = \phi/p = 1 + \pi.$$

Our last equation has no analogue in the Hicksian model. The method of financing budget deficits and surpluses is not treated as part of fiscal policy. Monetarists generally insist that there are important differences between deficits financed by issuing base money and deficits financed by issuing bonds. Eq. (6a) permits analysis of these differences and a comparison of open-market operations and deficit finance.

(6a) $G(i, S, p, g) - t(y, p) = dB + dS$

The G-function determines the government's nominal expenditure. Government expenditure includes total interest payments, so G depends positively on i and S. The t-function shows the dependence of tax collections on income and prices. Tax rates are assumed to be fixed. The left-hand side of the equation is the budget deficit, and the right-hand side shows that the deficit is financed by issuing base money or bonds. Both are nominal values, and all bonds are issued at par.

Given producers' and purchasers' anticipations—p^* and ϕ—the existing stock of capital, K_0, current policy decisions—g and dB (or dS)—and the past history of the economy, the seven equations of the monetarist model determine prices and interest rates—p, P and i—current real expenditure, D, the rate of change of real output, dy/y, the budget deficit or surplus and the amount of debt, dS (or base money dB), issued or absorbed by deficit finance and open-market operations. In equilibrium, the equilibrium rate of price change—the rate consistent with producers' and purchasers' anticipations—is determined also.

Comparison of some properties of the monetarist and the amended Hicksian model is facilitated by solving the output and credit market equations for market interest rates. The solution equations can then be shown as functions of real incomes. The positions of the two curves in the i, y plane depend on other variables, not only policy variables, anticipations and initial endowments, but also on the solution for asset prices. Figure 2 shows the two curves, labelled AM and OM, in the upper panel. The slope of each curve depends on some main postulates of the underlying analysis.[1]

The asset market, AM, curve is obtained by solving the credit and money market equations, Eqs. (4a) and (4b), for i and P, holding output constant. The position of the curve depends, *inter alia*, on the financing of a budget deficit or surplus. Increases in debt and reductions in the monetary base shift the AM curve to the left, raising interest rates. Debt retirement and increases in the base shift the AM curve to the right, lowering interest rates.

[1] The slopes of the curves are derived in Brunner and Meltzer [1]. The positive slope of the asset market (AM) curve requires that (1) the money market is more responsive to asset prices than the credit market, and (2) the credit market is more responsive to interest rates than the money market. This is a main postulate of the underlying analysis. The slope of the output market curve (OM) depends mainly on the homogeneity properties of the output market. If the expenditure function is homogeneous of degree zero in money prices and the value of money wealth, the output market equation is most likely negatively sloped in the i, y plane.

To obtain the output market (*OM*) curve, we take two additional steps. Neither is part of the monetarist hypothesis, and neither is required by our analysis. Both are taken to force the monetarist framework into the mould made popular by the *IS–LM* analysis, so as to bring out more fully the similarities and differences between the two.

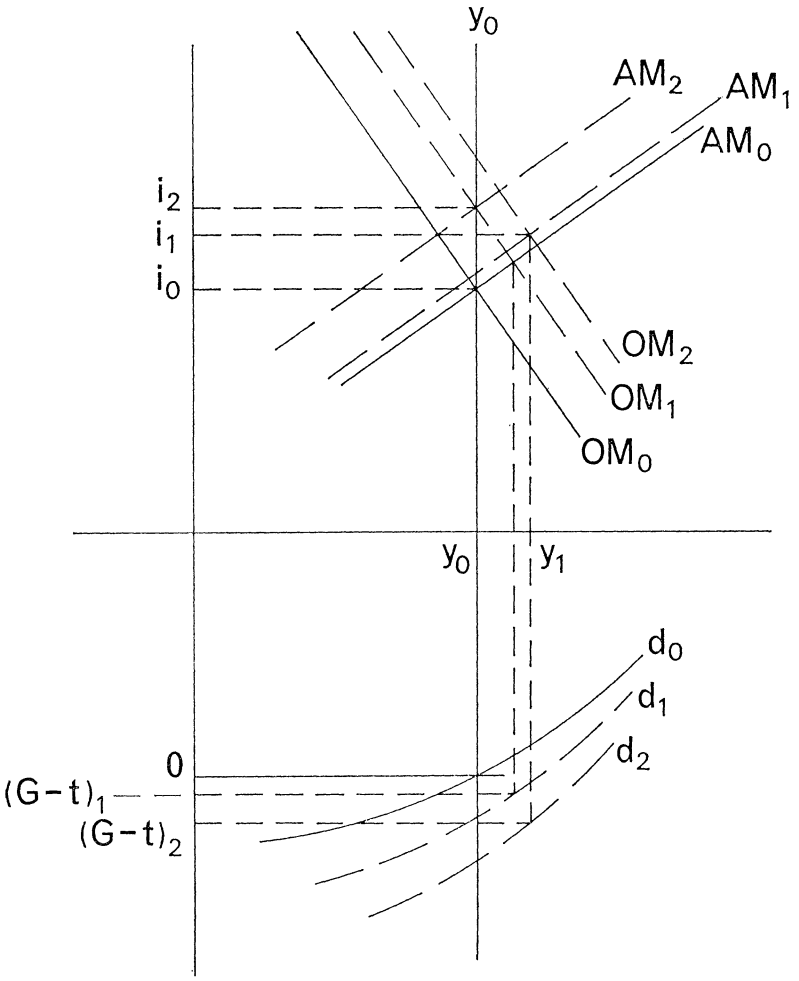

FIGURE 2

First, we assume that the output market is in partial equilibrium. At every point on an *OM* line, $y = D$. Second, we replace P in the expenditure function with the solution for P obtained as part of the simultaneous solution of asset market equations. One consequence of this step is that, in general, any change in the position of the *AM* curve is accompanied

by a change in the position of the *OM* curve. The *OM* curve now depends on the policy of deficit finance and on open-market policy, directly, as well as through the effect of the policy on prices and anticipations.[1]

The convenient assumption that the output market is in equilibrium, at prevailing prices and interest rates, closes one of the main channels by which costs of acquiring information and costs of adjusting affect the analysis. Two channels remain. Bonds and real capital are not perfect substitutes, and issuing or retiring debt affects the equilibrium positions of the asset and output markets. In the abridged model of a closed economy presented here, the monetary and fiscal authorities are free to choose either dB or dS and the amount of real expenditure, g. Once these choices are made, the deficit or surplus and its method of financing; are determined. Information about current policy is not available costlessly so the private sector must use resources to learn about current government policy and to forecast future policy.

The lower half of Figure 2 shows the relation between the deficit and the level of real income. The equation represented in that panel is obtained by substituting the solutions for the asset market equations into Eq. (6a). The slope of the curve depends on the effects of prices and output on the size of the deficit and on the amount of interest paid to service the debt.[2] The position of the curve depends on the method chosen to finance a deficit. An increase in S or a reduction on B shifts the curve to the right increasing the deficit or surplus at a given level of output.

The solid lines of Figure 2 show a position of stock-flow equilibrium. The budget is balanced; so there are no issues of debt or base money to change asset prices, interest rates, output or prices. The asset markets are in equilibrium at the prevailing levels of prices and output, and the output market is in equilibrium at the prevailing asset prices and interest rates. No changes in asset stocks shift the *OM* curve, and no changes in prices or the financing of the deficit shift the *AM* curve. With given anticipations, technology and endowments and with a balanced budget, the economy described by the monetarist model remains in equilibrium. The stock-flow equilibrium is a position of full employment.

Suppose the equilibrium is disturbed by an increase in real government expenditure for goods. Tax collections do not increase immediately by the full amount of the increased expenditure. The budget deficit is financed by new issues of debt.

The increase in real government expenditure, dg, increases total expenditure. In Figure 2, the increased expenditure is shown as a shift in

[1] Note that monetary policy cannot be "assigned" to determine the position of one curve and fiscal policy "assigned" to the other. Every monetary and fiscal change affects both curves.

[2] Interest payments are part of government expenditure. The expenditure concept used in our analysis differs from the expenditure concept in the national income accounts. The concept relevant for our analysis is the amount that must be financed by taxes, and by issues of debt and base money.

the position of the OM curve to OM_1, and the financing of the deficit is shown as a shift in the d-curve of the lower panel by dS $(=dg)$ to the position shown as d_1. The economy is in equilibrium at the intersection of OM_1 and AM_0 with budget deficit $(G-t)_1$. By assumption, g remains permanently at the new, higher level, so there is no further effect on the output market from this source. Each period, the deficit must be financed by a new issue of debt, so the $G-t$ curve continues to shift, and the effects of deficit finance continue to change prices and output.

Financing the deficit shifts both AM and OM. The increase in debt raises asset prices and interest rates for a given level of real income, moving the AM curve to the left. The OM curve has been obtained by replacing the asset price level with the (partial equilibrium) solution for asset prices. The rise in asset prices increases desired real expenditure; the OM curve shifts to the right. The financing of the deficit also affects nominal government expenditure and the nominal deficit by increasing interest payments from the government to the private sector.

A partial equilibrium position is shown at the intersection of OM_2, AM_1 and at d_2. Output, market interest rates, and the deficit are now at i_1y_1 and $(G-t)_2$. The partial equilibrium position is not a position of long-run, stock-flow equilibrium. The budget deficit is financed by issuing debt each period; so asset prices and interest rates continue to rise and the d-curve continues to shift down. Moreover, with real expenditure and real output above y_0, the output price level rises, and rising output prices generate anticipations of higher prices by purchasers and producers.

Any increase in the price level also raises tax collections. With progressive tax rates, and no substantial lag of tax collections behind receipts of income, rising prices reduce the size of the budget deficit. As the deficit declines, the volume of securities issued to finance the deficit declines, decelerating asset prices and interest rates.

The net effect of higher prices on output and expenditure, and on the position of the OM curve, depends on several relations. The direct effect of higher prices on expenditure is negative. Real expenditure declines as prices rise. Rising prices also stimulate producers' and purchasers' anticipations and raise the anticipated price level. Every increase in purchasers' anticipation shifts the OM curve further to the right; every increase in producers' anticipation shifts the OM curve to the left.

The expenditure function in our analysis is homogeneous of degree zero in all money prices and the value of nominal wealth. The direct effect of rising prices and the induced change in producers' anticipations eventually dominate other variables affecting the position of OM. The expansion of real output defined by the sequence of short-run equilibria reaches a maximum and declines. The OM curve now shifts in the direction of OM_0.

Rising prices and price anticipations reduce desired money balances and increase desired borrowing. The increase in the public's desired

borrowing and the new issues of securities to finance the deficit combine to shift the AM curve to the left. Market interest rates rise.

Progressive taxes and higher prices bring the budget into balance at the higher level of government expenditure. Once the budget is balanced, there are no further issues of debt to disturb the asset markets. With equilibrium on the asset markets, there are no changes in i or P to disturb the position of the output market. With the output market in equilibrium, there are no changes in y and p to disturb the equilibrium of the asset market or to change tax collections and the budget deficit or surplus. Once there is full stock-flow equilibrium and a balanced budget, the interest rate and the level of real output remain unchanged. In Figure 2, full equilibrium is restored at the intersection AM_2 and OM_1. Output is y_0, and the market interest rate is i_2; i_2 is above i_0 but may be above or below i_1, depending on the properties of the AM and OM curves. The budget is balanced at a higher level of nominal expenditure and higher tax collections. The solid line in the lower panel again shows the relation between the deficit and the level of output. To obtain this solution ϕ must rise in the same proportion as p.[1]

Market interest rates and the prices of assets and output are higher in the terminal than in the initial equilibrium. The rise in output prices is the means by which consumers are led to reduce private expenditure and to pay, via higher taxes, for the goods purchased by government. Any increase in output prices relative to asset prices, with the marginal product of capital unchanged, raises the real rate of return per unit of real capital. The rise in interest rates must be sufficient to encourage asset owners—banks and the public—to absorb the government securities issued to finance the deficit.

By assumption, the nominal stock of base money and the real stock of capital remain unchanged. In the terminal equilibrium, therefore, real wealth (deflated by output prices) consists of an unchanged stock of capital (of lower value) and a smaller stock of real base money. The change in the real value of the debt depends on the relative size of the changes in i, S and p.

With proportional tax rates, tax collections rise with the price level. If the increase in real government expenditure is maintained, nominal government expenditure on goods and service rises with the price level and rising interest payments. The size of the nominal deficit increases, therefore, as interest payments rise, and the acceleration of the nominal value of the outstanding debt raises asset prices and market interest rates. The real value of the deficit and the real increase in debt remain positive. Beyond some point, interest rates accelerate and asset prices

[1] In our discussion, we neglect the effect of increased interest payments on the slope of the curve in the lower panel. The curve becomes steeper, i.e., the deficit becomes larger at any output below y_0, and the surplus is smaller at any output above y_0. The solution shown in Figure 2 differs from the solution in Brunner and Meltzer [1] because we no longer hold producers' anticipations (ϕ) constant. The relative effects on ϕ, P, and p depend on the restriction that capital stock is constant.

decelerate. Prices and anticipated future prices rise. The model has no stable solution for this case. With the base and real capital constant, real interest rates rise toward infinity as the debt approaches infinity. A government that issues an infinite stock of debt cannot expect to pay a finite price to debt holders.

We can obtain an equilibrium solution by imposing one additional restriction. An increase in current or anticipated future tax rates brings the current or anticipated deficit to an end. Once the budget is balanced, there are no further increases in debt to disturb the asset and output markets; the economy reaches a stock-flow equilibrium.

III. Conclusion

Several of the implications of the monetarist model differ from the implications of the amended Hicks model. The slope of the *OM* curve does not determine the size of the response to monetary policy, and the slope of the *AM* curve does not determine the size of the response to fiscal policy. Monetary and fiscal changes and deficit finance affect asset prices and, therefore, change the positions of both curves. The proposition made familiar by the Phillips curve—relating the rate of price change to output or employment—is a postulate of the amended Hicks system and an implication of monetarist analysis. Moreover, the monetarist model provides no reason to expect stability in the Phillips relation. Differences between producers' and purchasers' anticipations of future prices and relative costs of acquiring information have a decisive effect on the relation.

To paraphrase Hicks ([2], p. 159), the amended Hicksian model has proved useful, but it is neither the beginning nor the end of dynamic economics. Recent discussion of costs of information, the effects of financing budget deficits, and the role of the credit markets provide the materials for a richer model incorporating many of the elements discussed in Hicks's synthesis of Keynesian and "classical" economics, but subsequently neglected.

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