A Monetarist Framework for Aggregative Analysis

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A MONETARIST FRAMEWORK FOR AGGREGATIVE ANALYSIS

by

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In developed, capitalist economies, relatively small fluctuations in production or expenditure for goods and services are accompanied or preceded by relatively large fluctuations in the prices and returns on claims and debts of various kinds. Fluctuations in the prices, volume and composition of claims held, issued and acquired by the principal financial institutions, by households and by firms are in turn, accompanied or preceded by changes in the stock of money.

Standard aggregative analysis represents output or expenditure and the return on claims and debts as the result of interactions that are summarized in two relations, the IS and LM curves. Claims and debts other than money play no formal role in the analysis. The existence of such claims and debts affects the outcome only, if at all, via the slopes of the IS and the LM curves, and discussion of any such effects is most often neglected. Fluctuations in the credit markets, where existing claims and debts are traded and new claims are issued, have no independent role in the determination of interest rates or other variables.

Participants in recent disputes about the role of money retain the standard framework. Monetarists have attacked the so-called "Keynesian" case in which output is determined
by expenditure, prices remain fixed and no distinction is made between real and nominal values of output and interest rates. Fiscalists, "ratists" and other non-monetarists concede that "money matters" and direct their criticisms to the doctrine that "only money matters".

Moving the discussion beyond the current stage requires a more complete and more explicit framework for aggregative analysis than has been provided. In this paper, we present a framework linking changes in monetary and fiscal policies to changes in output and linking prices and changes on the market for output to the money stock, desired money holdings and the size of the government deficit. A main part of our analysis is directed toward analyzing the interrelation between the markets for money, credit and output. In the following section, we develop the hypothesis. Then, we use the hypothesis to analyze the response of money, prices, interest rates, output and credit to an open market purchase. Finally, we discuss four characteristics that distinguish monetarist from non-monetarist hypotheses and place ours on the monetarist side of the line.

A Monetarist Hypothesis

The economy that we analyze has four, aggregated markets - the markets for output, credit, money and labor. Although the markets are interrelated, each will be thought of as approximately determining a price and quantity for given tastes, resources, and anticipations, given values of the policy variables and the outcomes on the other markets. In this restricted sense, the market for output determines the price level of current output, aggregate real expenditure and aggregate real output; the credit market distributes the outstanding stock of government debt between banks and the non-bank public and determines the volume of bank credit and a market rate of interest; the money market determines the stock of money and a price at which the outstanding stock of real capital is held; the labor market determines the wage rate and the volume of employment. The labor market and the determination of wages and employment are not treated explicitly here.

The government deficit and the financing of the deficit affect the three markets directly, by changing expenditure and the nominal stocks of base money and securities, and through the effects of the deficit and its financing on relative prices, output and the price level. The amount of real resources allocated to the government's programs and the effects of these allocations on the markets for credit, output and money are the result of the simultaneous determination of the government's deficit or surplus, relative prices, the price level, output and the stocks of money and credit.

The choice of markets to be analyzed distinguishes our version of the monetarist hypothesis from the more familiar Keynesian and IS-LM hypotheses. By separating total expenditure into two components, consumption and investment expenditure, the more familiar hypotheses imply that the distribution of the total between these two broad classes of expenditure has an important effect on the short-run determination of prices, output or interest rates. By merging the markets for money and credit, the standard hypotheses treat the interactions between these markets as of limited consequence. Our analysis assigns limited short-run importance to the distribution of expenditure between consumption and business investment and much greater short-run importance
to the distinction between credit and money and to the
changes in relative prices that the latter distinction
brings into focus. While we do not dispute the long-run
significance of changes in the capital stock, or in the
capital-output ratio, we treat short-run changes in this
ratio and in the distribution of expenditure between con-
sumption and investment as of limited significance.

In the remainder of this section, we point out some main
features of the hypothesis treating each market and the
government sector in turn. Table 1 of the appendix sepa-
rates the variables into broad categories and defines the
principal symbols.

The Output Market

The main relations of the output market are an aggregate
real expenditure function, a price setting function and
an equilibrium condition. Aggregate real expenditure has
two components, real private expenditure, \(d\), and real
government expenditure, \(g\). With tastes, technology,
population and capital stock fixed, and anticipations un-
changed, aggregate real expenditure equals aggregate real
output, \(y\), in equilibrium.

\[
y = d + g
\]

Real private expenditure depends on wealth and on expected
and actual prices or rates of return. The number of the
subscripts denotes the position of the variable in the
equation; the inequalities show the sign of the derivative
of the \(d\)-function with respect to the particular variable.

\[
(2) \quad d = d(i - \varpi, p, K, P, W_n, W_h, e, p^\star)
\]

with the properties \(d_1, d_2, d_3 < 0\)

\(d_4, d_5, d_6, d_7, d_8 > 0\)

There are five prices or rates of return; \(i - \varpi\), the interest
rate, \(i\), on financial assets net of the financial market's
anticipated rate of inflation, \(\varpi\), reflected in prevailing
market interest rates; \(p\), the price level of current output,
\(P\), the price level of existing real assets; \(e\), the antici-
pated net return on real capital per unit of real capital;
and \(p^\star\), the commodity price level anticipated by purchasers.
The remaining variables, \(W_n\), \(W_h\), and \(K\) are the nominal stocks
of non-human and human wealth and the real stock of capital.

The \(d\)-function is homogeneous of degree zero in the prices --
\(p\), \(p^\star\), and \(P\) -- and in the values of human and non-human
wealth. In the long-run, actual and anticipated rates of
price change are equal and the anticipated rates of price
change expressed in the money, bond and commodities markets
are the same, so \(p^\star/p = 1 + \varpi\). Every combination of long-run
equilibrium market prices and asset values, therefore,
implies a unique equilibrium \(p^\star\) which is to say

\[
\varpi = \frac{p^\star - p}{p} = \frac{dp}{p} \quad \text{in long-run equilibrium.}
\]

In the short-run, the anticipated rate of price change
reflected in commodity prices is not always identical to the
anticipated rate of price change reflected in the prices of
financial assets. Moreover, purchasers and producers of
commodities often have different anticipations about the
magnitude and even the direction of future changes. Since
costs of acquiring information are not identical for all
buyers and sellers or for all commodities, in the short-run
to the distinction between credit and money and to the changes in relative prices that the latter distinction brings into focus. While we do not dispute the long-run significance of changes in the capital stock, or in the capital-output ratio, we treat short-run changes in this ratio and in the distribution of expenditure between consumption and investment as of limited significance.

In the remainder of this section, we point out some main features of the hypothesis treating each market and the government sector in turn. Table 1 of the appendix separates the variables into broad categories and defines the principal symbols.

The Output Market

The main relations of the output market are an aggregate real expenditure function, a price setting function and an equilibrium condition. Aggregate real expenditure has two components, real private expenditure, \( d \), and real government expenditure, \( g \). With tastes, technology, population and capital stock fixed, and anticipations unchanged, aggregate real expenditure equals aggregate real output, \( y \), in equilibrium.

\[ y = d + g \]

Real private expenditure depends on wealth and on expected and actual prices or rates of return. The number of the subscripts denotes the position of the variable in the equation; the inequalities show the sign of the derivative of the \( d \)-function with respect to the particular variable.

\[ d = d(i-i, p, K, P, W_n, W_h, e, p^*) \]

with the properties \( d_1, d_2, d_3 < 0 \)

\[ d_4, d_5, d_6, d_7, d_8 > 0 \]

There are five prices or rates of return; \( i-i \), the interest rate, \( i \), on financial assets net of the financial market's anticipated rate of inflation, \( \bar{p} \), reflected in prevailing market interest rates; \( p \), the price level of current output, \( P \), the price level of existing real assets; \( e \), the anticipated net return on real capital per unit of real capital; and \( p^* \), the commodity price level anticipated by purchasers. The remaining variables, \( W_n \), \( W_h \), and \( K \) are the nominal stocks of non-human and human wealth and the real stock of capital.

The \( d \)-function is homogeneous of degree zero in the prices -- \( p, p^* \), and \( P \) -- and in the values of human and non-human wealth. In the long-run, actual and anticipated rates of price change are equal and the anticipated rates of price change expressed in the money, bond and commodities markets are the same, so \( p^*/p = 1 + \bar{p} \). Every combination of long-run equilibrium market prices and asset values, therefore, implies a unique equilibrium \( p^* \) which is to say

\[ \bar{p} = p^*/p - dp/p \]

in long-run equilibrium.

In the short-run, the anticipated rate of price change reflected in commodity prices is not always identical to the anticipated rate of price change reflected in the prices of financial assets. Moreover, purchasers and producers of commodities often have different anticipations about the magnitude and even the direction of future changes. Since costs of acquiring information are not identical for all buyers and sellers or for all commodities, in the short-run...
purchasers and producers learn about and adjust most rapidly and at lowest cost to changes in the prices of those commodities they buy and sell most frequently.

Changes in anticipations change the market value of wealth and relative prices, including market interest rates. Changes in relative prices and the market value of wealth modify the desired volume of real expenditures. The size of the anticipation-induced change in expenditure depends on the costs of acquiring information and the process by which purchasers form anticipations. For example, purchasers who acquire information at lowest cost or who form anticipations by extrapolating current price changes (or rates of change) respond differently from purchasers who do not perceive or do not extrapolate short-run price changes.

The importance of changes in anticipations for short-run and long-run expenditure is shown in Figure 1 where real private expenditure is drawn as a function of p, and, for convenience, g is kept at zero. Real expenditures are invariant with respect to an equi-proportional change in current and anticipated market prices (p, p*, and P) and the value of wealth. Such an equi-proportional change characterizes a long-run position, and all long-run equilibrium positions fall along the vertical line in Figure 1 where output and expenditure equal OA. The long-run positions of the expenditure function are denoted d₀ and d₂.

In the short-run, changes in relative prices p*/p and P/p reflect the system's absorption of various impulses including monetary and fiscal impulses. The short-run position of the expenditure function, d₁, is shown between the two long-run positions. The shift is from d₂ to d₁ and finally to d₀ in periods of deflation and from d₀ to d₁ and finally to d₂ in periods of inflation.

Positions B and E in the diagram differ only by equi-proportional changes in all nominal values. Relative prices are unchanged. Changes in relative prices -- p*/p and P/p -- on the other hand are necessary characteristics of the short-run position d₁. An inflationary impulse increasing expenditure from d₀ to d₁ is typically associated with a temporary expansion in economic activity and produces a point such as C to the right of the vertical. Similarly, a deflationary impulse, that starts from d₂ and lowers real expenditure to d₁, is associated with price responses yielding point D and a temporary reduction in economic activity. Neither position C nor D can be sustained. They induce further adjustments of relative prices that modify both the position of the expenditure curve and the supply curve s.

Equation (3) introduces the supply curve as a price-setting function. When combined with equation (2) and the equilibrium condition d + g = y, the three equations determine the price level, real output and real private expenditure.

\[
p = p(y, \kappa, \psi) p_1, p_3 > 0; p_2 < 0
\]
Two of the arguments of this function, y and K, have been introduced; the p-function is homogeneous of zero degree in y and K. The third argument of the function, Ψ, measures producers' anticipations. In the long-run the price anticipations of purchasers', producers' and operators' in the money market must satisfy the equilibrium conditions: \[ \frac{Ψ}{P} = \frac{P^*}{P} = 1 + \Psi. \] In the short-run, producers adjust current prices up or down as anticipations of higher or lower prices become more widespread or more firmly held. The response \( E(p, Ψ) \) of output price to \( Ψ \), measured as an elasticity, is less than unity in the short-run and converges to unity in the long-run. This pattern of price behavior results from the operation of costs of acquiring information and costs of adjusting to new and changing market conditions.

Moreover, the responsiveness of Ψ to changes in the environment depends on these same costs. Major events such as war, government announcements or policies and strikes alter Ψ. However, we do not explore these connections or channels of policy in this paper.

The supply curve in Figure 1 shows the effect of changes in Ψ on real output as a series of shifts from \( s_0 \) to \( s_2 \) when a higher price level gradually comes to be anticipated and a series of shifts in the opposite direction when lower prices are gradually anticipated. The supply curve is defined as a partial inversion of the price setting function. Starting from the equilibrium shown by the intersection of \( d_0 \) and \( s_0 \) at real output OA, various combinations of prices and real output can be obtained as the economy moves to a new long-run equilibrium. At the new equilibrium, shown as the intersection of \( d_2 \) and \( s_2 \), the price level is higher and real output and real expenditure again equal OA. In Figure 1, some of the short-run combinations are labelled C, D, F, G. It is unlikely that the economy would move through the entire sequence in any particular case; for example, a shift from B to D or from E to C seems particularly unlikely.

It is just as unlikely to expect the economy to move through a particular sequence of adjustment of prices and output at different times, or to expect the simple relation between price changes and some measure of the difference between output and capacity to be regular and reliable. The popular idea underlying many of the current estimates of the so-called trade-off between unemployment and the rate of price change presumes and builds on the stability of this simple relation. Our hypothesis implies that we should be slow to accept empirical findings relating deviations from capacity
output or levels of current output and employment to current or past price changes or rates of price change. A point such as G in Figure 1 may lie to the right or to the left of OA and at a higher or lower position on the price scale following a given sequence of price changes.

Even if the inflation or deflation starts from a position of maximum long-run output, such as OA, the size of the so-called "trade-off" depends on the relative responses of producers and purchasers and thus on the relative costs to each of these groups of acquiring information and adjusting prices. A relatively rapid adjustment of producers' anticipations lowers the expansion of output and employment induced by an inflationary impulse and the contraction of output and employment induced by a deflationary impulse. A relatively rapid adjustment of purchasers' anticipations accelerates the transitory real expansion induced by inflation and the transitory real contraction induced by deflation. The relative adjustment speed of producers' and purchasers' anticipations thus determines the shape and position of the so-called Phillips' curve, the nature and persistence of short-run trade-offs between real output and inflation.

If producers' and purchasers' anticipations change at the same rate and by equal amounts, so that anticipations of price change move the d and s curves concurrently, the short-run trade-off between inflation and real output is independent of anticipations. In this case differences in the short-run response of d and s depend only on the change in relative prices induced by inflation or deflation.

Human and non-human wealth appear as arguments of equation (2), the expenditure function. Both of the wealth variables have been the subject of considerable recent discussion seeking to refine the concepts and improve the measurements. Much of the recent discussion of non-human wealth applies capital theory to both the assets and the liabilities of financial institutions. An important distinction is drawn between the present value of the assets and liabilities of these institutions and the nominal values reported on accounting statements. The distinction applies to all balance sheets, but the recent discussion emphasizes the importance of the distinction for banks on the grounds that banks are licensed monopolies whose principal business involves acquiring assets and issuing liabilities.

Application of the same capital concepts to the anticipated future tax liabilities associated with a debt-financed government deficit shows that the present value of tax liabilities in a multiple tax system is not, generally, equal to the value of the government securities issued to finance the deficit. Further, government programs -- whether financed by debt or taxes -- both create and destroy monopoly positions and monopoly rents, positions that are frequently similar to the position of a licensed bank. The capital value of the rents is part of the market value of the public's net wealth. In our analysis, this contribution by government to nominal net private wealth is assumed provisionally (and perhaps heroically) to be proportional to the market value of the government debt. The value, therefore, depends on interest rates on financial assets, \( R \), and the schedule of tax rates, \( T_n \), on income from non-human wealth. Nominal private non-human wealth at market
value, is then

\[ w_n = \text{PK} + (1 + \omega)B + v(i, \tau_n)S \quad v_1, v_2 < 0 \]

where \( B \) is the monetary base, \( S \) is the stock of government securities at face value, \( \omega \) is the contribution of the monetary system to private net wealth per unit of base money, and \( v \) is the product of the price per dollar of \( S \) and the proportion of \( S \) that is included in net wealth. The derivatives of \( v \) with respect to both of its arguments are negative, and the size of both derivatives depend on the maturity structure of the debt. As the average maturity structure falls, a given change in interest rates or a change in tax rates induces a smaller change in the price per unit of outstanding debt. The two tax parameters, \( \tau_n \) and \( \tau_h \) below, represent a tax schedule. The parameters depend, therefore, on the distribution of taxable income and are modified by changes in the distribution of income.

Human wealth is the present value of the net returns from human effort. The nominal value, \( W_h \), is

\[ W_h = \frac{n(y^*, \tau_n; \theta)}{p} \quad n_1, n_2 > 0; n_3 < 0 \]

Taking productivity, \( \theta \), as constant and the distribution of income as given, an increase in expected income, \( y^* \), raises \( W_h \) by an amount that depends on the capitalization rate on human income streams. If this rate remains unchanged, the elasticity of \( W_h \) with respect to \( y^* \) (and with respect to \( p \)) is unity. Increases in scheduled tax rates, \( \tau_h \), on income from human wealth lower the value of private wealth; lower tax rates raise private wealth. The size of the change in wealth depends on the anticipated duration of the change in tax rates relative to individuals' horizons. Tax rate changes that are regarded as temporary - i.e. changes that are expected to persist for a period shorter than a representative individual's horizon - have less effect on wealth than permanent changes - changes expected to persist to the horizon and beyond.

The remaining variable that affects private expenditure is \( e \), the anticipated net yield on real capital per unit of real capital. For given distribution of income and given technology and productivity, \( \theta \), the net yield depends on anticipated real income, \( y^* \), and on \( \tau_n \), the schedule of tax rates on income from non-human wealth. Again, the effect of changes in the tax rate schedule depends on both the size of the change and its anticipated duration.

\[ e = \frac{n(y^*, \tau_n; \theta)}{p} \quad n_1, n_2 > 0; n_3 < 0 \]

\( e \) is the rate of return that purchasers of new capital anticipate. An increase in \( e \) raises, and a decrease lowers, real investment expenditure and, ceteris paribus, total expenditure. The anticipated rate of return, \( e \), is not identical to the real rate of return received by owners of real capital. Let \( R \) denote the latter rate. \( R \) equals \( e \) only when \( P = p \); elsewhere, \( R \) is proportional to \( e \).

\[ R = \frac{P}{p} e \]

Risk considerations aside, in long-run equilibrium \( R \) must also equal \( i - \Pi \). Short-run disturbances in the relation between \( e \), \( R \), and \( i - \Pi \) reflect changes in the relative prices of existing and newly produced assets and also reflect differences between actual and anticipated rates of price change. Disturbances of the equilibrium price and rate of return relations induce changes in borrowing and lending and in desired money holding.
The credit market performs several functions in our analysis. First, the interaction of the public and the banks as buyers and sellers of securities (proximately) determines the interest rate(s) on financial assets. Second, in the process of determining interest rates, the market distributes the outstanding stock of government securities and net additions to the stock. Third, the credit market permits individuals to increase utility by rearranging their balance sheets, to obtain preferred combinations of financial assets and liabilities, while keeping the market value of their net worth fixed. Both individuals and the aggregate public can rearrange balance sheets or portfolios by lending (acquiring government securities) and borrowing simultaneously.

For the present, we consider only the volume of borrowing and lending at commercial banks and the distribution of the stock of outstanding government securities. The aggregate volume of outstanding bank credit, \(E\), is most conveniently measured as the sum of the banks' portfolio of loans and the banks' holdings of government securities. This sum equals the amount borrowed from banks by the non-bank public plus the total stock of government securities (\(S\)) minus government securities held by the non-bank public, \((S_p)\).

\(E = L + S - S_p\). We describe the banks' operations on the market as the product of the monetary base, \(B\), and the bank credit multiplier, \(a\); the non-banks' decisions are summarized by:

\[(7a) \quad E = a( ) B = \sigma( )\]

The monetary base consists of the net monetary liabilities of the central bank, bank reserves plus currency. The bank credit multiplier depends on reserve requirement ratios, \(r\), the central bank discount rate, \(i_d\), the distribution of the public's money holdings between currency and demand deposits and the distribution of deposits between demand and time accounts. We summarize these decisions, as in our previous work, by including market interest rates, deposit rates \((i_d)\), asset prices, wealth and the anticipated yield on real capital as arguments of the \(a\)-function, equation (7b).

\[(7b) \quad a = a (i, i_d, P, W_n, W_h, e, i_d, r)\]

\[s_1, s_2, s_3, s_4, s_5 > 0; \quad s_6, s_7, s_8 < 0\]

The public's nominal stock-supply of earning assets to banks depends on most of the variables of the expenditure function, and in addition, on the outstanding stock of government securities, \(S\). Ceteris paribus, either a rise in \(P\), the prices of existing assets, or a decline in \(e\) lowers the rate of return, denoted \(R\) above, received or anticipated by owners of real capital. Equity financing becomes less costly than debt financing, so the volume of bank borrowing (and the offering of private debt securities) declines. A rise in \(P\) (or a decline in \(e\)) also raises the public's demand to hold outstanding securities. The public's attempt to acquire a larger portion of the outstanding stock of securities, \(S\), further reduces \(\sigma\). A rise in the anticipated price level, \(p^*\), raises \(\sigma\). Households and businesses sell securities
previously held as assets and seek to borrow from banks and other financial institutions so as to hold inventories and acquire additional real assets. An anticipation of lower prices, a decline in \( p^* \), lowers \( \delta \).

Changes in nominal wealth have an ambiguous effect on \( \delta \). Increases in wealth raise, and decreases lower, the public’s desired indebtedness. However, increases in wealth also raise the public’s desired holdings of securities, and with \( S \) unchanged, \( \delta \) falls. The net effect of nominal wealth on \( \delta \) depends, therefore, on (1) the relative strength of the effects of wealth on the public’s desired indebtedness \( (L) \) and their desired holding of securities, \( S_p \), and (2) on whether the distribution of wealth between human and non-human wealth and of non-human wealth between base money, securities and capital is held constant. We introduce two postulates to remove the ambiguity. First, \( \Theta_5 \) and \( \Theta_6 \) are positive, so increases in \( W_n \) and \( W_h \) raise, and decreases lower, \( \delta \); second, the long-run \( \delta \)-function is homogeneous of first degree in \( p \), \( p^* \), \( P \), \( W_n \) and \( W_h \). Equi-proportional changes in prices and nominal wealth that leave the proportions of base money, securities, capital and human wealth to total wealth unchanged leave the public’s desired ratio of debt to equity and the relative size of the banking system unchanged.

The short-run effects of fiscal policy on bank credit and market interest rates depend on the type of fiscal change and particularly on the method of financing the change. Increases or decreases in government expenditure accompanied by equal changes in the monetary base shift the stock of bank credit, \( aB \), in the same direction as the fiscal change and initially, change the composition and value of wealth.

Market interest rates, initially, rise if the base decreases and fall if the base increases. Changes in government expenditure entirely financed by issuing or withdrawing securities shift the \( \delta \)-function in the same direction as the fiscal change and, initially, change the value and composition of wealth. Holding constant the distribution of securities between the banks and the public, interest rates and bank credit rise with a deficit and fall with a surplus. Changes in government expenditure financed by an equi-proportional change in tax rates that leave the relative tax burden unchanged initially affect the credit market by changing \( e \) and \( W_h \). Tax increases lower, and tax reductions raise, market rates.

The response of market interest rates to a temporary change in tax rates, like the response of aggregate expenditure, depends on the anticipated duration of the temporary change and on the relevant horizon. Our hypothesis implies that, ceteris paribus, temporary changes in tax rates have smaller effects on \( e \) and \( W_h \) and, therefore, on \( E \) and \( i \) than permanent tax changes. However, temporary tax rate changes are systematically associated with other changes. For example, tax increases introduced as part of a program to reduce a larger than anticipated government deficit reduce the amount of new securities to be absorbed by the banks and the public. The increased tax payments just equal the decline in the rate of increase of the stock of government securities. In this case, the announcement of a tax increase reduces the rise in interest rates resulting from the anticipated deficit. Tax reductions have the opposite effect. The deficit increases, raising \( \delta \), \( E \) and \( i \).
In summary, and disregarding any feedback from the output market, tax rate changes affect the credit market immediately by changing e and \( W_h \) and by changing the rate of change of S. Higher tax rates lower e and \( W_h \) and reduce the increase in S; lower tax rates raise e and \( W_h \) and the rate of increase of S. Transitory and maintained tax changes of equal magnitude have identical effects on S but have different effects on E and i. The difference is a consequence of the smaller changes in e and \( W_h \) induced by changes in tax rates that the representative individual treats as temporary and expects to see reversed.

All monetary policies affect the credit market. Monetary policy consists of changes in the monetary base, in the reserve requirement ratios, in the discount rate, and in the ceiling on interest rates paid on bank deposits. Each of these changes affects the stock of bank credit by changing the base or changing the value of a. Changes in the base and in the reserve requirement ratios also change the nominal stock of wealth, either directly or, for the reserve requirement ratios, by raising or lowering the profitability of banking and the net worth of banks.

The Money Market

In the Keynesian tradition, the market rate of interest, \( i \), is (proximately) determined in the money market by the demand for money and the given stock of money. In James Tobin's recent work, the money market determines the real rate of return on real capital. In our analysis, the market interest rate is (proximately) determined on the credit market; the money market determines the nominal stock of money and the price of existing real capital, \( P \). Equation (8a) shows the nominal stock of money, \( M \), as the product of a money multiplier, \( m \), and the monetary base. In equilibrium, prices and the value of wealth have adjusted so that the nominal stock, \( L \), is willingly held.

\[
(8a) \quad M = m ( ) B = L ( )
\]

Money is defined as currency and demand deposits. The money multiplier, \( m \), depends on policy variables such as the reserve requirement ratios and the discount rate and on the variables that determine the banks' desired reserve ratio, the public's distribution of money holdings between currency and deposits and their distribution of deposits between demand and time account. An increase in the proportion of deposits held on time account lowers the money multiplier and raises the bank credit multiplier, equation (7b), increasing the stock of bank credit relative to the stock of money. Consequently, the response of the money multiplier to changes in variables that affect money by changing the composition of deposits is opposite to the response of the bank credit multiplier.

\[
(8b) \quad m = m (i, i_t, P, W_n, W_h, e, i_d, r)
\]

\[
m_1, m_6 > 0 \quad m_2, m_3, m_4, m_5, m_7, m_8 < 0
\]

In the very short-term, the money and bank credit multipliers also depend on the distribution of deposits between the government and the private sector. We ignore these effects here.
The variables that appear as arguments of the demand function for money are the same as the variables of the \( \mathcal{G} \)-function with one exception. \( S \) is not an argument of the demand function. The properties of the \( L \) and \( \mathcal{G} \)-functions, however, are very different.

\[ L = L (1, P, p^*, p, W_n, W_h, e) \]

\[ L_1, L_3, L_7 < 0; \quad L_2, L_4, L_5, L_6 > 0 \]

Changes in \( p^* \), \( P \) and \( e \) have opposite effects on \( L \) and \( \mathcal{G} \). The differences are seen by comparing the signs of the derivatives \( L_2, L_3 \) and \( L_7 \) to \( \mathcal{G}_2, \mathcal{G}_3 \) and \( \mathcal{G}_7 \). If purchasers anticipate higher prices, \( p^* \) increases, borrowing increases, the demand to hold securities and the demand for money fall. An anticipated fall in prices reduces the public’s desired indebtedness to banks and increases the demand for money and the demand to hold securities. Increases in \( P \) or reductions in \( e \) reduce the demand for borrowing and raise the demand for money and for outstanding securities. An additional difference between the \( L \) and \( \mathcal{G} \) functions is that the wealth elasticities of the \( L \)-function exceed the corresponding elasticities of the \( \mathcal{G} \)-function.

The Government’s Budget Policy and Other Variables

In most discussions of fiscal policy, tax rate changes affect output by changing disposable income and nominal expenditure. Expenditure and output are real variables in our model, and neither tax collections nor tax rates appear in the expenditure or price-setting function.

Changes in real government expenditure change total expenditure and, by creating or destroying monopoly rents, change \( v \) and thus change \( \mathcal{W}_n \). In addition, the effect of a government deficit depends on the way in which the deficit or surplus is financed.

Current government expenditure can be financed in the usual three ways: by taxes, new issues of debt or increase in the monetary base. Equation (9) states that the deficit or surplus at current prices, \( G-t \), equals the new issues or retirements of government securities from the central bank, \( dB_1 \), and new issues or retirements from banks, other financial institutions and the public, \( dS \).

\[ G-t = dB_1 + dS \]

Although the sum \( dB_1 + dS \) is fixed by the size of the current surplus or deficit, economists have considerable interest in the mix. A more useful form of equation (9) separates the financing of a deficit from a "pure" open market operation, the latter defined as \( dB_1 = -dS \). Let

\[ \text{(9a)} \quad dB_1 = \mu (G-t) + \nu \]
\[ \text{(9b)} \quad dS = (1-\mu)(G-t) - \nu \]

and let \( \mu \) be the portion of the deficit financed by selling securities to the central bank and issuing base money (or the portion of the budget surplus resulting in debt retirement from the central bank and a reduction of base money). The parameter \( \nu \) permits us to separate open market policy from the financing of a deficit. If the government finances a deficit by selling bonds to the public while
the central banks purchase debt via open market operations, \( \mu > 0 \) in equation (9) whatever deceptive appearances result from prevailing institutional arrangements. On the other hand, if the budget is balanced, \( dB_1 = -dS \), and net increases or decreases in \( B_1 \) are the result of "pure" open market operations. A necessary condition for a pure open market operation, \( \nu \neq 0 \), is either a balanced budget, \( G = t \), or \( \mu = 1 \), or \( \mu = 0 \).

With tax rates and current expenditure given, the size of the deficit or surplus depends on output and prices. Under a progressive income tax, rising income and prices raise tax accruals, and falling income and prices lower tax accruals. Equation (9c) is the tax accrual function.

\[
(9c) \quad t = t (p, y, T_h, \tau_n)
\]

The budget that the government prepares, approves, and finances is fixed in nominal terms. Our expenditure function is in real terms. We use the output price index to deflate current government expenditures.

\[
(9d) \quad g = G/p
\]

The last policy variable, the monetary base, is defined in equation (9e) as the sum of two sources. \( B_1 \) is the cumulated sum of government debt acquired by the central bank. \( B_2 \) includes all other sources of the monetary base but mainly central bank discounts, gold and foreign exchange.

\[
(9e) \quad B = B_1 + B_2
\]

Finally, we introduce a minimal set of responses of the anticipation variables to the endogenous variables. It is sufficient for our present purposes to let \( p^*, y^* \) and \( \psi \) depend on current output and price level in such a way that the elasticities \( \xi(y^*, y), \xi(p^*, p), \xi(\psi, p) \) and \( \xi(\psi, y) \) can be defined. Each of the elasticities is positive, and the first three elasticities are unity in the long-run but below unity in the short-run. The fourth elasticity, \( \xi(\psi, y) \), reflects producers' intermediate-run anticipations of market changes and their adjustment to new information about market conditions.

The Response to An Open Market Purchase

Some main properties of the hypothesis can be illustrated by solving the equations for the output, credit and money markets to obtain equilibrium values for output, market interest rates, and the prices of assets and output. In this section, we first show the solutions in a graph and trace the response to an open market purchase. Tax rates, the government's budget, the stock of capital, technology and the anticipation of the long-run level of real output remain unchanged. The equations underlying the solutions shown in each quadrant are given in Table 2 of the appendix. Then, we present a more explicit statement of the formal relation governing the short-run response of output to an open market operation.

The heavy black lines in Figure 2 show an initial equilibrium position. In the upper right quadrant, we have plotted equation (2) and the inverse of equation (3). We use the equilibrium condition, \( d + g = y \), to solve for the
output price level, \( p \). The position of the d-function, denoted \( d_Q \), and the solutions \( p_0 \) and \( y_0 \) depend on the other variables in the d-function such as \( P \), \( i \), \( p^* \), and \( e \).

The upper left quadrant shows the equilibrium relation between \( p \) and \( P \). The curve in this quadrant is obtained by solving the money market equations for the asset price level, \( P \), and plotting the solution for \( P \) as a function of \( p \), holding constant all other variables in the equations - \( i \), \( W_m \), \( W_h \), \( e \), \( p^* \), \( B \). The negative slope of the curve depends on the derivatives \( L_2 \) and \( L_4 \) of the demand equation for money, equation (8c).

**Figure 2**
The Response to an Open Market Operation
The homogeneity properties of the \( L \) and \( m \) functions imply that an equi-proportionate change in \( p \), \( p^* \), \( W_h \), \( W_n \) and \( B \) induces the same relative change in \( P \). All long-run solutions with unchanged relative prices, therefore, lie on a ray from the origin through a point such as \( p_0 \), \( P_0 \) in Figure 2, and all positions of equilibrium at unchanged relative prices lie along a ray of this kind. Along each such ray the composition of wealth remains unchanged.

The lower left quadrant shows the equilibrium relation between \( P \) and \( i \) obtained by equating the real rate of interest, \( R = \frac{P}{P} e \), to the real rate of interest on financial assets, \( R = i - \Pi \), setting \( \Pi = \frac{P^*}{P} - 1 \), then solving for \( i \) as a function of \( P \).

\[ i = \frac{P}{P} e + \frac{P^*}{P} - 1 \]

The heavy solid line labelled \( p_0 \) is drawn holding \( p \), \( p^* \) and \( e \) constant and with \( p^*/p = 1 \). The (partial) elasticity of \( i \) with respect to \( P \) depends on the rate of inflation. The elasticity approaches zero as the rate of inflation or rate of deflation becomes relatively high. As the assumed zero rate of inflation along \( p_0 \), the elasticity is \(-1\).

In the lower right quadrant, we use the credit market equations to solve for the market rate of interest, \( i \), and plot the solution as function of \( y \). The relation between \( y \) and \( i \) reflects the dependence of the \( G \) and \( a \) functions on \( W_h \) and \( e \) and therefore on \( y^* \) and \( y \). The slope of the \( i \), \( y \) relation depends on the relative size of the elasticities of \( G \) and \( a \) with respect to \( y \). The available empirical work \(^{13}\) supports the hypothesis that \( \varepsilon (G, y) \)

is substantially larger than \( \varepsilon (a, y) \), and we have, therefore, drawn the \( E \)-curves with positive slopes. The position of the curves depends on the same variables as the money relation in the upper left quadrant and, in addition, on the stock of government debt.

An open market purchase increases the monetary base and lowers the stock of government securities held by the banks and the public. \(^{14}\) The stocks of money and credit increase, interest rates fall and \( W_n \) increases. Three of the curves in Figure 2 shift. (1) The increase in \( B \) and reduction in \( S \) shift the \( E \) curve to the right, lowering interest rates on the credit market and raising \( W_n \). (2) The decline in \( i \) and the rise of \( P \) and \( W_n \) increase real expenditure, shown by the shift in the \( d \)-curve to the right, the rise in \( y \) and (slight) increase in \( p \). (3) The increase in \( B \) raises, and the reduction in \( i \) lowers, the position of the \( M \) curve. The net effect, however, is a shift to the right. The increase in \( P \) and decrease in \( i \) is shown as a movement along the \( p_0 \) curve in the lower left quadrant.

A new, short-run equilibrium is reached at higher expenditure, output, money and credit, higher \( p \) and \( P \) and lower \( i \). The adjustment to the changed values of output, prices and wealth in all markets is shown by the dashed line connecting the short-run equilibrium values by the curves \( M_1 \), \( E_1 \), and \( d_1 \). The increase in \( p \) also shifts the \( i-P \) relation in the lower left quadrant to the right. Observations suggest that both the initial change in \( p \) and the shift in the curve are small, and the new curve is now shown.

The new equilibrium shown by the dashed line is not a complete adjustment to the open market purchase. Market prices,
output and nominal values have adjusted, but we have kept anticipations unchanged. The prevailing price, $p_1$, is above the anticipated price, $p^*$, at the short-run equilibrium position described by the dashed lines. If $B$ and $S$ remain at their new levels, there is no reason to expect prices to return to their previous level; i.e., there is no reason to anticipate a fall in market prices. Hence, $p^*$ cannot remain unchanged but must rise by no less than $p_1 - p_0$. The change in $p^*$, may, of course, be larger than the change in $p$.

An increase in $p^*$ shifts the expenditure function to the right, increasing $y$ and $p$. The increase in $p^*$ also affects the money market equilibrium relation. The demand for money falls as $p^*$ rises; $P$ increases, and the $p$-$P$ curve in the upper left quadrant shifts to the left. The rise in $P$, lowers the market interest rate as shown by the movement along the $i$-$P$ relation of the lower left quadrant.

Both the size and the direction of the change in market interest rates depends on the relative changes in $p^*$, $P$ and $p$. If the increase in $p^*$ is less than or equal to the increase in $p$ (and the anticipated real return to real capital, $e$, does not increase), market rates remain below the initial equilibrium, $i_0$. The curve labelled $p_2^*$ is drawn to the left of the $p_0^*$ curve. Any shift of the $i$-$P$ curve to the left and any rise in market interest rates above their previous equilibrium at $i_0$ is a consequence of either (1) a larger increase in $p^*$ than in $p$, or (2) an increase in $e$, or (3) some combination of the two, increased $e$ and $\frac{\Delta p^*}{\Delta p} > 1$.

The credit market is the market on which the interest rate is proximately determined. An increase in $p$ induces the public to borrow more from banks and to sell government securities to banks. The rise in $p$, therefore, increases the stock of earning assets offered to banks and the market rate of interest. Increase in $p^*$, $p$ or $e$ raise $E$ and $i$, and increases in $P$ lower $E$ and $i$. For interest rates on the credit market to rise above their previous equilibrium at $i_0$ without a reduction in the monetary base or an increase in $S$, the combined effect of higher $y$, $p$, $p^*$, $e$ and the accompanying increases in nominal wealth must more than offset the effect of higher $P$ on bank credit and interest rates. Since interest rates and the stock of bank credit generally rise in periods of economic expansion, we have drawn the diagram to show an increase in the market rate. The new equilibrium box in Figure 2, through $i_2$, $P_2$, $p_2$, $y_2$, shows the combined effects on the three markets of changes in prices and wealth and the increase in the ratio of $p^*$ to $p$.

The equilibrium at $p_2$, $y_2$, $i_2$, $P_2$ is not a long-run equilibrium, $P$ and $p^*$ have increased relative to $p$; purchasers' anticipations of future prices have increased, while producers' anticipations ($Ψ$) have been kept unchanged. Long-run equilibrium cannot be restored by prices, interest rates and purchasers' anticipations of future prices returning to the previous equilibrium. Such a fall in actual and anticipated prices leaves the community with increased real stock of base money and decreased real value of government debt. To complete the return to full equilibrium, producers must revise anticipations; $Ψ$ must rise. An increase in $Ψ$ shifts the supply curve of output to the left (not shown) raising the price level to $p_3$ in Figure 2.
unchanged at p*, P falls; the public's supply of earning assets rises shifting the E-curve to the left and raising market interest rates.

The adjustment to the open market purchase continues until a new long-run equilibrium is reached. In the new equilibrium, as in the old, output equals $y_0$. The nominal stocks of money and credit and the prices $p$, $P$, and $p^*$ remain above the prices in the initial equilibrium. With tastes unchanged, the homogeneity properties and the substitution of base money for government securities in the public's portfolio imply that the real value of the base and the net worth of the banking system increase; the real value of the stock of government securities falls, and the real value of real capital, $S$, rises. With tastes equal to unity, the fall in market interest rates and the rise in the value of real capital reflect the same phenomenon - the increase in $P$ relative to $p$ in the equilibrium reached following an open market purchase.  

An open market purchase or sale is a change in $\mathbf{v}$. Equation A3 of Table A defines the response of output to an open market operation as the sum of two components. One, the "pure" base effect, is measured by $\mathbf{E}(y, B_2)$, the elasticity of output with respect to the source component $B_2$. We obtain this effect holding constant the government's budget deficit or surplus and $S$, the outstanding stock of government securities. The second component of equation (A3) is $\mathbf{E}(y, S)$, the change in output induced by the change in $S$. Both components are weighted sums of elasticities. Equations (A1) and (A2) show these elasticities. Each contains three main building blocks.

The partial equilibrium, market-by-market approach that we have followed to this point brings out the role of the credit market and of relative price changes but fails to develop fully the interaction between credit, money and output markets that is a main feature of the hypothesis. Discussion at a more formal level is required to show these interactions and to indicate the principal factors on which the size and sign of the response to an open market operation depend. A full analysis of monetary and fiscal policy must be deferred, however, and we limit our analysis to the effect of an open market operation on real output holding price anticipations constant.
to express the results as elasticities. The third building block consists of the coefficients of the linear combination inside the brackets. The coefficients depend on the properties of the real expenditure function, specifically the interest elasticity, asset price elasticity and wealth elasticity of the d-function.

The bracketed expression contains the second and third building blocks. These blocks combine the "real balance effect" with the product of (1) the response on the asset market, holding the output market variables constant and (2) the response of expenditure to changes in $i$ and $P$ induced by a change in $B_2$. The very small size of the ratio $B_2/W_n$ reduces the magnitude of the real balance effect -

$$\varepsilon(d, W_n)(1 + \omega) \frac{B_2}{W_n}$$

- once we leave the pure exchange economy and recognize that the capital stock is by far the largest component of wealth.

The signs of the first and third blocks are unambiguous. The sign of $\varepsilon(y, B_2)$, therefore, depends on the asset market elasticities of $i$ and $P$ with respect to $B_2$. The first of these, $\varepsilon(i, B|AM)$, is negative, and its coefficient, $\varepsilon(d, i)$, is negative also. Increases in the base raise, and decreases lower, real output by changing market interest rates. The sign of $\varepsilon(P, B|AM)$ depends on the relative size of the interest elasticities on the credit market and the money market, principally on the size of $\varepsilon(G, i) - \varepsilon(a, i)$ relative to $\varepsilon(m, i) - \varepsilon(L, i)$.

The Hotelling conditions imply, and empirical observations confirm, that the credit market elasticities exceed the money market elasticities, so that $\varepsilon(P, B|AM)$ is positive.

Since the coefficient of the $P$ elasticity is positive, the "asset price effect" of a change in the base augments the "interest rate" effect. The Hotelling condition assures that $B_2$ and $y$ are positively related.
The Short-Run Response of Output to Open Market Operations and Producers' Anticipations

1. The response to a pure change in the base $B_2$:

\[
\frac{\partial y}{\partial B_2} = \left[ \frac{\partial^2 y}{\partial B_2^2} \right] + \left[ \frac{\partial^2 y}{\partial B_2 \partial i} \right] + \left[ \frac{\partial^2 y}{\partial B_2 \partial P} \right] + \left[ \frac{\partial^2 y}{\partial B_2 \partial W_n} \right]
\]

(i) $\gamma = \frac{d}{y} = \frac{y}{y}$ is the proportion of private real expenditure to total output and $\Delta$ is obtained by first replacing the variables $i$ and $P$ appearing in the output market expression $y - d - g$ with their implicit solutions derived from the asset market equations, then differentiating throughout with respect to $y$. The resulting total derivative is converted into an equivalent expression containing elasticities. $\Delta$ is a measure of the net response of the output market to a unit percentage change in output.

(ii) $\xi(i, B_2|AM)$ and $\xi(P, B_2|AM)$ are derived from the two asset market equations and describe the responses of $i$ and $P$ to changes in $B_2$ generated by the interaction of the asset markets while disregarding feedback loops via the output markets. Application of the Hotelling conditions implies that $\xi(i, B_2|AM) < 0$ and $\xi(P, B_2|AM) > 0$.

(iii) $\xi(d, i)$ and $\xi(d, P)$ describe properties of the aggregate expenditure function $d$.

\[
\xi(d, i) = \xi(d, i) + \xi(d, W_n) \xi(v, i) v^n < 0 \\
\xi(d, P) = \xi(d, P) + \xi(d, W_n) P^k v^n > 0
\]

The total elasticity $\xi(d, i)$ measures the total response of $d$ to a unit change in $i$ and consists of the partial elasticity, $\xi(d, i)$, and the change in wealth, $\xi(d, W_n) \xi(v, i) v^n$, induced by a change in $i$. The total elasticity $\xi(d, P)$ has a similar composition.

2. The response of output to a change in the stock supply of government securities $S$ measures the response to a deficit or surplus financed by issuing or withdrawing securities.

\[
\frac{\partial y}{\partial S} = \left[ \frac{\partial^2 y}{\partial B_2 \partial i} \right] + \left[ \frac{\partial^2 y}{\partial B_2 \partial P} \right] + \left[ \frac{\partial^2 y}{\partial B_2 \partial W_n} \right]
\]

\[
\xi(i, S|AM) > 0 < \xi(P, S|AM)
\]

3. The response to a pure open market operation $\nu$ expressed by a change in $B_4$, is the weighted sum

\[
\frac{\partial y}{\partial B_4} = \xi(y, B_4) \frac{B_4^2}{B_2^2} - \xi(y, S).
\]

(End of Table A)
The response of output to a change in the stock of government securities is obtained similarly. The first and third building blocks introduced above occur again in (A2). The second building block differs but again describes the response patterns of the asset market. In this case however, the responses are the elasticities of interest rates and the asset price level with respect to S. The signs of the partial derivatives in equations (7) and (8) assure that both $\varepsilon(i,S/AM)$ and $\varepsilon(P,S/AM)$ are positive. An increase in the stock of securities raises market interest rates and the price of a unit of real capital, a conclusion that is entirely consistent with standard relative price theory.

Multiplying the elasticities by their coefficients, as in equation (A2), shows that the response of output to a change in S is ambiguous. If money and securities are very close substitutes and money and real capital are very poor substitutes, the response via asset prices dominates the response of interest rates and $\varepsilon(y,S)$ is positive. Succinctly, if the money market elasticity is large enough, $\varepsilon(y,S)$ turns positive. Once again, the size and sign of the response depends on the Hotelling conditions.

The response of output to open market operations, equation (A3), clearly depends on the relative interest elasticities on the credit and money markets. If the Hotelling conditions are strongly satisfied, $\varepsilon(y,B_2)$ is relatively large and $\varepsilon(y,S)$ is negative. In this case, $\varepsilon(y,B_1) > \varepsilon(y,B_2)$; an open market operation has a larger effect on output than a pure change in the base. With sufficiently weak satisfaction of the Hotelling conditions, the above sign is reversed; the effect of open market operations is less than the effect of a pure change in the base. We believe that $\varepsilon(y,S)$ is relatively small. If our conjecture is correct, open market operations and other changes in the base have approximately the same effect on real output.

Tracing out the long-run results of an open market purchase as a sequence of short-run changes, as in our discussion of Figure 2, or differentiating over the system and allowing for the feedback between asset and output markets, as in the discussion of Table A, brings out some of the distinctive features of our hypothesis. The principal difference between our analysis and the standard IS-LM framework is not in the long-run comparative statics response to the purchase but in the short-run positions the economy is expected to reach. The differences are the result of our more explicit treatment of (1) short-run positions, (2) the role of the credit market, and its interaction with the real market, (3) the divergent short-run movements in credit and money, (4) the effects of changing the stock of securities that the banks and the public must hold and (5) the implications of these changes for the relative prices of assets and output and for interest rates. Further, differences in producers and purchasers anticipations explain much of the divergence between short- and long-run positions conventionally summarized in some form of trade-off between prices and real output. In the following section, we develop some of the differences in implications and their relation to "monetarism".
Four Monetarist Conjectures

Monetarist criticisms of standard aggregative analysis, represented by the IS-LM framework, concentrate on four main points: (1) descriptions of the mechanisms transmitting monetary and fiscal policies; (2) the roles assigned to public and private policies as causes of fluctuations; (3) the failure to interpret correctly the role of monetary policy and the effects of monetary changes; and (4) the neglect of the distinction between aggregative and allocative effects of policies. In this section we use our framework to distinguish between the monetarist and non-monetarist positions on the four issues. Although there is incomplete agreement among monetarists on any one of the four points and perhaps even less agreement among non-monetarists, we believe that, taken together, the positions on the four points distinguish monetarists from non-monetarists.

In the standard IS-LM paradigm, the transmission of monetary and fiscal policies depends on the slopes of the IS and LM curves and particularly on the interest elasticities of the expenditure and demand for money equations on which the slopes depend. A relatively interest inelastic demand function for money and a relatively interest elastic expenditure function make monetary policy relatively potent; a relatively interest elastic demand function for money and a relatively interest inelastic expenditure function make monetary policy much less potent, and fiscal policy much more potent, per dollar or per unit percentage change in the policy variables.

Monetarists conjecture that the transmission of monetary and fiscal policies involves more than the slopes or elasticities of the two curves. They assert that there is a systematic relation between the positions of the IS and LM curves and past policies, particularly monetary policies.

Two changes in the position of the curves are recognized quite generally. One is the shift in the LM curve resulting from the change in the price level. This shift is a consequence of the fixity of the economy's real resources. With given tastes and technology, neither monetary nor fiscal policy can maintain real output above the level set by available real resources; attempts to do so cause the price level to rise and output to fall until the real resource constraint is satisfied. The rise in the price level is shown as a shift in the LM curve until it intersects the IS curve at the level of real output obtainable with fixed real resources and unchanged tastes and productivity. The second shift, generally described as significant for long-run but not short-run adjustment, is the "real balance effect". The presence of real money balances in the expenditure function shifts the position of the IS curve when there are changes in nominal money or in the price level. Unanticipated changes in nominal money balances change real expenditures in the same direction as the change in money balances. With real resources fixed, prices rise or fall until real money balances, and therefore real expenditures, return to their previous level. In the IS-LM paradigm, the real balance effect is both necessary and sufficient for a change in the position of the IS curve during the adjustment to a monetary expansion or contraction.
One of the principal monetarist conjectures is that the emphasis on slopes and neglect of other than long-run shifts in the IS and LM curves omits a significant part of the economy's adjustment to monetary, fiscal or other changes. Finite, positive, marginal costs of adjusting and marginal costs of acquiring information are introduced to explain the transition from the very short-run response, through a series of intermediate positions, to the long-run position set by tastes, opportunities and long-run anticipations. The fact that the costs of acquiring information and adjusting are positive is used to justify Keynes' proposition that expenditure changes mainly affect output in the short-run. These costs also explain the occurrence of rising prices (or rising rates of inflation) associated with expanding activity when resources are unemployed. (Figure 1 above.)

The short-run response to a monetary or fiscal change, in our analysis, includes the revision of producer and purchaser anticipations. A once-and-for-all change in the monetary base, in the budget deficit, or in the stock supply of securities, at first, changes current prices very little. The gradual adjustment to each of these policy changes requires an adjustment of producers' and purchasers' anticipations. Both the change in policy and the adjustment of anticipations change the market prices of real assets, financial assets and current production until a new equilibrium is established. The resulting sequence of short-run changes can be described as a series of changes in the positions of the IS and LM curves. Descriptions of this kind add little to the analysis unless they state a mechanism responsible for the systematic shift in expenditure and output. The interrelation of the markets for credit, money and real output provides one such mechanism, the one we outlined above. Adjustment to relative price changes explains the shifts in the IS curve and the observed pattern of cyclical changes in market interest rates.

The second and third monetarist conjectures assert that fluctuations in prices and output are most often the result of government policies, particularly monetary policies. Monetarists do not deny that random shocks or changes in tastes, attitude, or anticipations are capable of starting a process of expansion or contraction, but they reject the emphasis on the instability of the private sector featured in the Keynes-Hicks view of the trade cycle. Monetarists replace the unstable dynamics of the real sector that underlie the IS curve of the Keynes-Hicks analysis with a stable private sector that absorbs and dampens the fluctuations emanating from an unstable government sector.

These differences explain part of the often noted differences in policy views. To non-monetarists, government policies - particularly fiscal policies - are the means by which public policy can offset the instability in the private sector. Fiscal policy is often presented as a principal means of reversing or offsetting the shifts in the IS curve resulting from excess or deficient private expenditure. Monetarists regard changes in the rate of monetary expansion as a main source of instability. Changes in fiscal policy are seen as having aggregative effects primarily (but not entirely) because they give rise to changes in monetary policy; i.e. because budget deficits are to a considerable extent financed by expanding money and budget surpluses most often result in reductions of the money stock. Fiscal policies financed mainly by issu-
ing and retiring government securities, at unchanged monetary growth rates are a smaller - but not always negligible - source of instability. To avoid the instability induced by large and/or frequent changes in the growth rate of money, monetarists often favor limits to discretion where non-monetarists favor maintenance of, or increases in, discretionary authority.

An important analytic and empirical issue reopened by the monetarist conjectures is the extent to which the waves of optimism and pessimism that shift the IS curve are mainly the result of past policies and the failure of businessmen and households to anticipate correctly the price level, real rates of return and rates of price change. Current monetarist and non-monetarist discussion suggests that cyclical fluctuations in expenditure and in the ratio of expenditure to output are the result of changes in anticipations. Monetarists single out prior changes in the growth rate of money as a principal - and often the principal - cause of changes in anticipations. However, both monetarists and non-monetarists have been relatively inexplicit about the mechanisms relating prior changes in the growth rate of money or other variables to anticipations and to current changes in expenditures. Most often, some distributed lag is introduced.

Our analysis does not assign a dominant or important role to changes in the rate of price change during business cycles. Sustained expansive or contractive policies change the anticipated rate of price change and, thus, supplement the induced changes in interest rates resulting from changes in desired indebtedness, desired holding of securities and money that form the main channel transmitting the effects of policy between the markets for money, credit, output, real capital and, by extension, labor. The cresting of waves of expenditure that economists in the Keynes-Hicks tradition attribute to the instability of the private sector are seen here as delayed effects of past policies on expenditures via the actual and anticipated price of assets and price level of output.

The differences between several alternative explanations come out most clearly in the (implicit or explicit) explanation of cyclical changes in market interest rates. Economists who attribute these changes to unanticipated changes in the demand for real capital generally invoke random shocks (Schumpeter) or waves of optimism and pessimism (Keynes and Hicks) to explain the persistence of the initial deviation from equilibrium. Rising investment, whatever its cause, raises interest rates and real output; falling investment reduces interest rates and real output. The fact that market interest rates generally rise in periods of economic expansion and fall in periods of contraction is, on this interpretation, the result of unforeseen changes in anticipated returns, the end of our analysis. A considerable body of empirical research on the timing of changes in investment and output, and much more limited evidence on cyclical changes in real rates of return, casts doubt on this explanation.

One alternative explanation replaces or supplements changes in private investment with changes in fiscal policy. Government expenditures for war, for domestic programs, to offset an actual or anticipated decline in private expenditure, or tax reductions that produce budget deficits, each of these and their sum is used to explain increases in market rates.
of interest and real expenditure; reductions in government expenditure or increases in tax rates that produce budget surpluses or smaller deficits are used to explain declines in market interest rates and real output. The observed positive correlation between market interest rates and output during business cycles is alleged to result from fiscal policy.

Our version of the monetarist hypothesis attributes the positive correlation to the feedback through the credit market. Expansive monetary policies initially reduce market interest rates. However, expansive monetary policies also induce a substitution of real capital for money, raising the price of existing real capital, as in the discussion of Figure 2 and Table A above. The rise in the price of real capital induces the public to sell securities from their asset portfolios and reduce borrowing, so $S$ declines. The decline in $S$ reinforces the decline in market interest rates produced by the expansive monetary policy. But, the rise in $P$ and reduction in $i$ increase expenditure, output, actual and anticipated price levels and therefore induce the public to borrow from banks and sell outstanding securities. Market interest rates rise in periods of economic expansion and fall in recession under the combined impact of these changes unless the interest elasticity of the public's demand for money $\varepsilon(L,i)$ is substantially larger than the interest elasticity of the public's supply of earning assets to banks, $\varepsilon(S,i)$. A very interest elastic demand function for money is not a sufficient condition for a negative relation between interest rates and real output. Nor is a very large interest elasticity of the demand function for money sufficient to make monetary policy impotent. The interest elasticity of the public's asset supply function need only be larger to assure that policies that increase the stocks of money and bank credit also increase expenditure. Empirical studies of the U.S. monetary system show that this condition has been satisfied.

A positive cyclical relation between interest rates and output supports the monetarist assertion of a dominant cyclical effect of money on expenditure. The reason is that the same condition that assures that changes in interest rates are dominated by the responses on the credit market, $|\varepsilon(S,i)| > |\varepsilon(L,i)|$, is an essential part of the condition required to make the effect of a given change in monetary policy larger than the effect of an equal change in government expenditure financed either by tax rate changes or by issuing or withdrawing outstanding debt.

Non-monetarists often favor, and monetarists oppose, selective controls on the allocation of credit, regulation of interest rates on particular assets and other, similar controls. Credit controls, eligibility rules on the type of assets acceptable for discount at the central bank, restrictions imposed on particular institutions that encourage or discourage the acquisition of particular credit instruments, these and other similar allocative devices are often proposed as a means of preventing inflation or encouraging expansion. The many equations comprising the monetary sector of large-scale econometric models are justified as a means of capturing the effects on interest rates and expenditure of changes in the composition of portfolios. Econometric model builders and others treat the allocation of credit as a determinant of the levels of aggregate output and employment and of the rate of inflation.
The fourth monetarist conjecture separates the aggregative and the allocative effects of policies. Monetarists either deny that changes in particular market rates and the composition of financial assets affect aggregate expenditure and the price level, or they minimize these effects.

By disaggregating the credit market equations introduced above, we can separate the aggregative and allocative effects of policy or other changes. Let

\[ S = S_1 + S_2 + S_3 \]
\[ L = L_1 + L_2 \]

where \( S \), the outstanding stock of securities, now consists of taxable government securities, \( S_1 \), tax-exempt securities, \( S_2 \), and privately issued securities, \( S_3 \), and \( L \), the amount of outstanding loans, consists of non-mortgage loans, \( L_1 \), and mortgages, \( L_2 \). Under the previous equilibrium condition for the credit market, equation (7)

\[ a(\theta)B - \theta(L + S - S_p) = 0 \]

where \( S_p \) is the stock of securities held as an asset of the public. This condition now expands to take account of the borrowing by non-financial institutions and lending by non-bank institutions in each market. Let \( F \) represent the demand for earning assets by non-bank financial institutions and \( N \) the demand to hold earning assets by the non-bank, non-financial private sector.

On the market for taxable, government securities,

\[ \alpha_1 aB + F_1 + N_1 = S_1 \]

on the tax-exempt securities market,

\[ \alpha_2 aB + F_2 + N_2 = S_2 \]

on the market for non-mortgage loans,

\[ \alpha_3 aB = L_1 \]

on the mortgage loan market,

\[ \alpha_4 aB + F_3 = L_2 \]

and on the market for privately issued securities,

\[ F_4 + N_2 = S_3 \]

The \( \alpha_i \) (\( i = 1, \ldots, 4 \)) allocate the stock of bank credit among the main categories of assets in the banks' portfolios. The allocation to each category depends on relative rates of interest, with allowance for differences in risk and costs of acquisition. The sum of the \( \alpha_i \) is unity, so the four equations containing portions of the banks' portfolio can be summed to obtain total bank credit.

\[ a(\theta)B = L + S - F - N \]

The composition of this sum depends on the relative rates of interest; the sum itself does not.

The equations for the privately issued securities market proximately determine the interest rate on private securities, \( S_3 \), in terms of the rates on \( S_1 \), \( S_2 \), \( L_1 \) and \( L_2 \). We combine the four rates in an index; the index of rates replaces the market rate determined in our previous anal-
ysis, and equation (7d) replaces equation (7a) as the equilibrium condition for the credit market.

The monetarist conjecture is that the index of rates exploits most of the information affecting aggregative behavior generated by the credit markets. Aggregating the sub-markets into a stock of credit implies that details of the allocations made by various lenders are of little importance in an analysis of aggregative behavior. The alternative conjecture, perhaps best represented by the Radcliffe report in Great Britain, assigns an aggregative effect to the portfolio decisions of individual lenders or the decisions of particular suppliers to issue securities. The changes in relative interest rates generated by these decisions are presumed to affect aggregate output, the price level or rate of inflation.

Conclusion

Accumulating evidence on the dominant role of government policies, and particularly monetary policies, is one source of evidence for the broad framework that has become known as "monetarism". Inability to demonstrate any significant aggregative effects of the various attempts to control the allocation of "credit" is another. These sources of evidence, and others, provide a partial assessment of the relative quality of alternative approaches to an analysis of fluctuations in output and prices.

Detailed assessment of the monetarist conjectures requires a framework capable of generating the propositions identified with the monetarist position. Our purpose in this paper has been to present such a framework, to state the monetarist propositions or conjectures and to sketch the relation between the framework and the propositions.

To demonstrate some main features of the hypothesis, we traced the effect of an open market purchase and showed the role of supplier and producer anticipations, the relation of stocks of money and credit and their relation to the flow of output. By distinguishing between the stocks of money and credit, we are able to provide a more fully developed analysis of real and nominal rates of interest and of the prices of assets and output than can be obtained in the customary IS–LM framework.

Although our hypothesis has many of the features found in the standard paradigm, there are several differences. First, the effect of government expenditure on nominal or real output does not depend in any simple way on the usual
"multiplier" that is so much emphasized in the traditional Keynes-Hicks analysis. The transmission of fiscal policy, like the transmission of monetary policy, involves changes in relative prices, anticipations and wealth. Second, and related, we emphasize the role of the prices of existing assets, including market interest rates, and the current and anticipated price of new output, and do not restrict our analysis to a single asset and a single interest rate. Third, we do not require the real balance effect as a necessary condition for equilibrium at full employment. Even if the real balance effect was always zero, under relatively weak constraints, changes in relative prices restore full employment equilibrium. We believe that these features of our hypothesis are among those that permit a more searching and thorough discussion and appraisal of the monetarist conjectures than has been possible heretofore.

**Footnotes**

*) We appreciate the continued assistance each of us receives from the National Science Foundation and thank William Silber for helpful comments on an earlier draft.


3) The particular features or implications that make the hypothesis "monetarist" are discussed in a later section.
4) Our choice is arbitrary. We do not derive the aggregate relations from micro relations and do not discuss aggregation except in the case of the credit market, (below), and then only partially.

5) The negative derivative of $d$ with respect to $\lambda$ ($d_\lambda$) reflects the effect of $\lambda$ on real investment expenditure. We have put aside the appropriate measurement of $\lambda$ and the effects of obsolescence on $\lambda$. One additional point that requires emphasis is that $\lambda$ does not include the capital in the banking system. The latter is included as part of non-human wealth via the factor in equation (4).

6) The homogeneity property of the expenditure function assures that real expenditures are invariant between $B$ and $E$. This invariance does not apply, typically to the adjustments induced by monetary and fiscal actions. These actions generally induce changes in relative prices and thereby affect the long-run volume of real private expenditures. Below, we discuss the response to an open market operation in more detail.

7) If extrapolators of price changes dominate the market, the elasticity $\xi(p^*, p)$ can exceed unity. If, in addition, real expenditure is sufficiently responsive to $p^*$, the short-run position $d_1$ can lie above $d_0$ in periods of inflation and below $d_0$ in deflation. We do not discuss these cases in the text.

8) Some individuals may interpret a change in current prices as an indication that the direction of price change will be reversed in the future. In our notation, $\xi(p^*, p)$ can be negative for some individuals or some markets. It is difficult to attach much significance to anticipations of this kind as an explanation of shifts in total real expenditure or to accept them as descriptive of price anticipations in enough markets to dominate the aggregate anticipations affecting the price index during periods of maintained inflation or deflation. Anticipations of this kind are clearly relevant for the type of anticipated price changes produced by a cobweb hypothesis.


10) Any change in U.S. reserve requirement ratios is equivalent to a change in the tax rates on bank capital because banks do not receive interest payments on required reserves. Increases or decreases in the rate at which banks or competing financial institutions are chartered, or changes in the relative powers of competing financial institutions, alter the value of the banks' charters and, thus, change $\omega$. In addition, $\omega$ increases or decreases with changes in the value of real capital in-
vested in the banking industry. The real capital invested in the banking system — with or without competitive banking — is part of net wealth but not part of K. (See footnote 5.)

11) The analysis underlying this section and the one that follows is developed in more detail in our "Liquidity Traps ...", op. cit. and in Albert Burger, An Explanation of the Money Supply Process, (Belmont, Calif.: Wadsworth Publishing Co., 1971).

12) Inter alia see James Tobin, "A General Equilibrium Approach to Monetary Theory", Journal of Money, Credit and Banking, Feb. 1969, pp. 15 - 29. The relation between Tobin's procedure and ours can be described with little difficulty. As above, let R be the real rate of return on real capital. In our symbols,

\[ R = \frac{P}{P} e \]

Tobin takes p as given and for given e determines R and therefore P in the money market. We treat p as a variable proximately determined in the commodities market and separate the determinants of e into policy and pre-determined, non-policy variables, as shown in equation (6). The money market determines P and, therefore, R.

13) Our empirical estimates, given in Table C1 of "Liquidity Traps ...", op. cit., p. 34 show the elasticity of i with respect to y as 1.8. See also, Burton Zwick, An Equilibrium Theory of Interest Rate Determination, Ph. D. thesis, Carnegie-Mellon University 1970. In a recent paper, Martin Feldstein und Otto Eckstein present evidence that supports our finding. In "The Fundamental Determinants of Interest Rates", Review of Economics and Statistics, November 1970, pp. 365 - 75, their regressions show the effect of log of real per capita income on the level of market interest rates. At a mean corporate bond rate of 5%, their computed elasticity in their equation (9) is substantially the same as ours, 1.8.

14) The distribution of the debt between the banks and the public remains unchanged throughout.

15) The argument depends on a constant K and, consequently, neglects any feedback from changes in p/P to real net investment and K. The constancy of K, the long-run elasticity \( \varepsilon(p, \Psi) = 1 \) and the homogeneity properties of equation (2), when taken together, imply that y returns to \( y_0 \) while p/P and i are permanently changed. The changes in p/P and i, in turn, imply that there is a change in the composition of expenditure from the initial to the terminal equilibrium. Open market purchases raise, and open market sales lower, real private expenditure. Since y returns to \( y_0 \), and nominal G is unchanged, the real volume of government expenditure moves opposite to the real volume of private expenditure.


<table>
<thead>
<tr>
<th>Flows or Changes in Stocks</th>
<th>Stocks</th>
<th>Prices and Yields</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y ) (1) aggregate real output</td>
<td>( W_h ) (5) nominal human wealth</td>
<td>( i ) (7) market rate of interest</td>
</tr>
<tr>
<td>( d ) (2) aggregate real private expenditure</td>
<td>( W_n ) (4) market value of non-human wealth</td>
<td>( P ) (8) price of existing capital</td>
</tr>
<tr>
<td>( t ) (9c) nominal value of tax accruals</td>
<td>( M ) (8a) stock of money</td>
<td>( p ) (3) price level of new production</td>
</tr>
<tr>
<td>( dB_1 ) (9d) change in security portfolio of central bank</td>
<td>( E ) (7a) stock of credit</td>
<td>( e ) (6) expected real net yield on real capital per unit of real capital</td>
</tr>
<tr>
<td>( dS ) (9e) change in stock of government debt outstanding</td>
<td>( B ) (9a) monetary base</td>
<td></td>
</tr>
<tr>
<td>( g ) (9b) real value of government expenditure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Variables Taken as Given in the Analysis**

**Policy Variables**

- \( \tau_n \) = schedule of tax rates on income from non-human wealth
- \( \tau_h \) = tax rate schedule on income from human wealth
- \( i_d \) = central bank discount rate
- \( \rho \) = proportion of a deficit (surplus) financed by issuing (withdrawing) base money
- \( \gamma \) = changes in the central bank portfolio that are independent of activities financing the budget deficit or surplus
- \( G \) = government expenditure at nominal value
- \( S \) = nominal stock of debt outside the government sector
- \( r \) = weighted average reserve requirement ratio

**Predetermined Values and Anticipations**

- \( \pi \) = anticipated rate of price change
- \( p^* \) = anticipated price level
- \( y^* \) = anticipated real income
- \( w \) = net worth parameter for the banking system
- \( f^* \) = a summary measure of producer's intermedierun anticipations
- \( B_2 \) = other sources of the monetary base (mainly foreign exchange and gold)
- \( K \) = existing stock of real capital
- \( i^* \) = interest rate paid on bank deposits
TABLE 2
Partial Equilibrium Solutions for Output, Credit and Money Markets*

1. the output market
\[ \log p = \frac{1}{\xi(y,p) - \xi(d,p)} \left[ \xi(d,i-y) \log Y + \xi(d,p) \log P + \xi(d,p^*) \log p^* - \xi(y,i) \log Y + \xi(d,e) \log e + \ldots \right] \]

2. the money market
\[ \log P = \frac{1}{\xi(L,p) - \xi(m,p)} \left[ \left[ \xi(m,i) - \xi(L,i) \right] \log i - \xi(L,p) \log P + \log B - \xi(L,p^*) \log p^* + \ldots \right] \]

3. the credit market
\[ \log i = \frac{1}{\xi(s,i) - \xi(s_i)} \left[ \left[ \xi(s,P) - \xi(G,P) \right] \log P - \xi(G,p) \log p - \xi(G,S) \log S + \log B - \xi(G,p^*) \log p^* + \ldots \right] \]

4. the relation between real and nominal rates
\[ i = \frac{\bar{p}}{p} \text{e} + \frac{p^*}{p} - 1 \]

*) \( \xi(j,k) \) is the elasticity of \( j \) with respect to \( k \).