A MONETARIST MODEL OF WORLD INFLATION AND THE BALANCE OF PAYMENTS

Thomas M. Humphrey

The inflation of the past ten years has been a worldwide phenomenon. Accordingly, analysts have become increasingly aware that any satisfactory explanation of price level behavior must account for its international character. These analysts fall into three main schools. First are the *eclectics,* who attribute world inflation to a complex and ever-changing mixture of causes, e.g., the exercise of monopoly power by oil-producing nations; the international conjuncture of cyclical booms; and the occurrence of bad harvests, poor fish catches, and other autonomous reductions in the supplies of key commodities. Second are the members of the *cost-push school,* who blame inflation on worldwide labor militancy. Third are the *global monetarists,* who, in sharp contrast with the other schools, focus largely or exclusively on the monetary factor.

The theoretical basis of this third approach is the monetary theory of the balance of payments. As usually presented, this theory assumes that the countries of the world are linked together (as they actually were until 1973) by fixed exchange rates between freely convertible currencies. The sum total of these currencies converted into a common unit at the fixed exchange rate constitutes the world money stock. This stock, in conjunction with the demand for it, determines the world price level, which is then transmitted to individual countries by commodity arbitrage, the operation of which tends to equalize prices in all markets. Finally, by importing or exporting money in exchange for goods and securities, each nation uses the mechanism of the balance of payments to bring its domestic money stock into line with the exact quantity required to support the price level. When applied to the interpretation of recent inflationary experience—at least up to 1973 when fixed rates were widely abandoned for flexible ones—this theory implies that excessive world monetary expansion generated the inflation, that commodity arbitrage propagated it, and that the balance of payments mechanism distributed the world money supply as required to accommodate or validate it in each nation.

This article seeks to explain the foregoing theory and its public policy implications with the aid of a simple expository model of the international monetary mechanism. Although originally constructed for the specific purpose of analyzing the economic effects of a currency devaluation, the model is easily adaptable to the monetarist explanation of world inflation.[1] In fact, it constitutes an almost ideal framework within which to articulate the global monetarist view because it embodies most of the elements essential to that view. These elements are outlined in the following section, which serves as a necessary preliminary to the description of the model and its components.

Monetarist Propositions Any analytical model that conveys the essence of the global monetarist explanation of world inflation must contain certain key ingredients that characterize that approach. These elements include the following:

1. THE VIEW OF THE WORLD AS THE RELEVANT CLOSED ECONOMY. The global monetarist views the world as a closed system of interdependent open national economies connected by fixed or imperfectly floating exchange rates. In this view, nations are interpreted as *regions* of the closed world economy, and problems of inflation in any particular nation are treated as purely regional phenomena, as are questions relating to an individual nation's distributive share of the world money stock.

2. THE QUANTITY THEORY OF MONEY. The quantity theory constitutes the second key component of the global monetarist view. The quantity theory states that the path of world prices in long-run equilibrium is completely determined by the path of the world money stock. This conclusion follows from the theory of the interaction between the demand for real (price-deflated) money balances and the nominal stock of money. The demand for real balances is interpreted as a stable mathematical function of a few macroeconomic variables, the most important being real income and an inter-

[1] The model is presented by Dornbusch in [3]. See Mundell [4, Chapter 8; 5, Chapters 9, 10, 11, 12, 15] for an earlier and somewhat different treatment of the main elements of the model. The most complete description of the Dornbusch model appears in Whitman [7], who uses it to explain the global monetarist approach to the balance of payments. Swoboda [6] and Claassen [2] employ the Dornbusch model to analyze world inflation under fixed and flexible exchange rates, respectively. Also see Branson [1] for a similar approach. The present article follows Whitman and Swoboda closely.

est rate variable representing the opportunity cost of holding money. Given the values of these independent variables, the theory states that the price level will adjust to bring the real volume of any nominal stock of money into equality with the amount demanded. From this it follows that if the income and interest rate determinants of the demand for money are given, an exogenously given nominal stock of money completely determines the price level. More generally, in terms of a growing world economy, the long-run rate of world monetary expansion determines the steady-state rate of world inflation, given the trend growth rate of world output. Two important implications of the quantity theory should be noted at this point. The first is that money has no influence on real economic variables in the long run. The second is that in long-run equilibrium the price level will vary in exactly the same proportion as the money stock. Known as the neutrality and equiproportionality postulates, respectively, these two propositions must be embodied in any mathematical model that purports to represent the logical structure of the global monetarist view.

3. LAW OF ONE PRICE. From the universally accepted proposition that commodity arbitrage tends to equalize prices of identical traded goods across countries—due allowance of course being made for tariffs and transportation costs—monetarists move directly to the proposition that general price levels also tend to be equalized. Monetarists note that in a world of rigidly fixed exchange rates between freely convertible currencies money itself becomes a homogeneous traded good whose price, like that of any other traded good, will be equalized internationally. But since the domestic price of money in terms of goods is simply the inverse of the general price level, it follows that equalization of the price of money implies equalization of national price levels. This point, incidentally, distinguishes modern global monetarists from their classical counterparts of the 18th and 19th centuries, notably David Hume and David Ricardo. The latter group argued that the volume of imports and exports depends on domestic prices relative to foreign prices and that changes in these relative prices constitute a key link in the automatic specie-flow mechanism that operates to correct payments imbalances and to maintain the equilibrium international distribution of the precious metals. Modern monetarists deemphasize such relative price effects on the grounds (1) that efficient arbitrage prevents price disparities from developing except for the briefest of intervals and (2) that the automatic adjustment process operates mainly through divergences between income and expenditure rather than through the classical relative price mechanism.

4. MONETARY INTERPRETATION OF THE BALANCE OF PAYMENTS. The fourth key component of the monetarist approach is the concept of the balance of payments as the means by which open economies adjust their existing stocks of money to the stocks they desire to hold. Suppose a country's actual money stock is smaller than the stock its residents desire to hold. Endeavoring to replenish their cash balances, these residents will cut their expenditure thereby releasing resources for the export trade. The country will run a trade balance surplus, exporting goods and importing money until the gap between actual and desired money stocks is eliminated. Conversely, if the existing stock of money is greater than that desired, national expenditure will exceed national output and the country will run a trade balance deficit, importing goods and exporting money until the excess money balances are worked off. In this manner, each nation will use its balance of payments to attain monetary equilibrium, and for the world as a whole, the balance of payments mechanism will distribute the world money stock across nations consistent with monetary equilibrium in each nation. The key assumption underlying the foregoing view is that, in the long run at least, national central banks do not use open market operations and other policy weapons to offset or neutralize ("sterilize") the impact of external money flows on the behavior of the domestic money stock. One justification for this assumption is that the effect of sterilization operations would be to create international interest rate differentials that would induce capital flows sufficient to undermine the sterilization policy. Finally, it should be noted that the nonsterilization assumption means that from the point of view of an individual country the money supply is an endogenous variable completely determined by the public's decisions to acquire or get rid of cash through the balance of payments. Here the traditional monetarist assumption of an exogenous money stock applies only to the closed world economy and not to individual open national economies.

Constituting the essential ingredients of the monetarist theory of world inflation, these four elements are incorporated in the analytical model presented below.

The Model and Its Components The model itself consists of a hypothetical two-country world economy represented by a set of equations containing the following variables. Let D be the desired stock of national nominal money balances and M the actual stock composed of a domestic credit component C and an international reserve component R. Furthermore, let $\dot{M}$ and $\dot{R}$ be the rates of change (time derivatives) of the national money stock and its foreign exchange reserve component, respectively, and A be an adjustment coefficient representing the speed of adjustment of actual to desired money stocks. Also, let K be the desired ratio of nominal cash balances to nominal income, Y the level of real output, P the price level, and X the exchange rate (domestic currency price of a unit of foreign currency). The cash balance ratio K is treated as a numeri-

cal constant, and the output and exchange rate variables are taken as exogenously-determined givens. Finally, let E be nominal national expenditure and B the trade balance measured in domestic currency. For simplicity, the trade balance is identified with the overall balance of payments, i.e., the capital account and international capital flows are ignored. Unstarred variables refer to the home country, starred variables to the foreign country (i.e., rest of the world), and the subscript w to the closed world economy. Percentage rates of change of variables are represented by lower-case letters—for example, p is the percentage rate of change of the price level P.

Purchasing Power Parity Equation The first equation of the model is the goods arbitrage or purchasing power parity equation

$$(1) \quad P = XP^*,$$

which embodies the "law of one price" proposition that international arbitrage tends to equalize the money price of goods in terms of either currency. The equation states that the price level in the home country is equal to the product of the exchange rate and the price level in the foreign country, implying that the price levels in the two countries are the same when converted into a common unit at the fixed exchange rate. Note that this equation corresponds to the global monetarist view that national commodity markets are merely parts of a single unified world commodity market.

Money Demand Equations The second part of the model consists of demand for money equations, one for each country. These equations express the stock of nominal money balances that the public desires to hold in the aggregate as a constant fraction K of the level of nominal national income (the product of the price level and the exogenously given level of real output). The equations are written as follows:

$$(2) \quad D = KPY \text{ and } D^* = K^*P^*Y^*.$$

As written, these demand functions comply with the quantity theory of money in at least three respects. First, the exogeneity of the real output variable squares with the quantity theory's assumption that output is determined independently of the behavior of money in the long run. Second, the demand functions exhibit a one-to-one relationship between the quantity of

money demanded and the price level. In the technical jargon of monetary theory, the functions are said to be homogeneous of degree one in prices. This homogeneity property implies both (1) absence of money illusion (the inability of economic agents to distinguish between real and nominal economic magnitudes) and (2) long-run neutrality of money as postulated by the quantity theory. It also ensures that the theory's equiproportionality postulate will be satisfied, i.e., that the price level will vary in exactly the same proportion as the money supply. Third, the demand functions exhibit the stability required by the theory, this stability being assured by the assumed constancy of the desired money/income ratios.

Money Supply Equations The foregoing demand equations represent only one side of the money market and must be matched by supply equations representing the other. These equations are derived from the consolidated balance sheet of the commercial banks and the central bank of each country. By a simple accounting identity, the monetary liabilities of those sectors can be shown to be backed by an equivalent amount of assets as indicated by the equations

$$(3) \quad M = C + R \text{ and } M^* = C^* + R^*.$$

Here M is the narrowly defined money supply (currency plus demand deposits), C is domestic credit defined as the banking system's holdings of net domestic assets, and R is the banking system's holdings of international reserves. The foregoing equations merely express national money stocks as the sum of their respective source components, domestic and foreign. Of these two components only the first is under the control of the monetary authority. By contrast, the foreign source component—and therefore the money stock itself—is determined by the public's demand for cash. If the public is just satisfied to hold the existing stock of money, any policy-engineered change in the domestic credit component will induce an equal but opposite change in the foreign source component, leaving the nation's money stock unchanged.

Corresponding to the national money supply equations is the equation

$$(4) \quad M_w = M + XM^*$$

that defines the world money stock M_w as the sum of the national money stocks expressed in a common currency unit. The world money stock

is treated as an exogenous variable. This follows from the assumption that the quantity of world reserves is given. Given the latter, all the components of the world money stock, namely the domestic source component of the national money stocks plus world reserves, are exogenous and therefore so is the world money stock itself. Note, however, that while total world reserves can be treated as a given, a single nation's reserve holdings cannot be so treated, which is the reason national money supplies are endogenous variables from the viewpoint of the national authorities. Despite their simplicity, equations 3 and 4 are taken as constituting an accurate specification of the supply side of the money market.

Money market equilibrium, of course, requires that money demand equal money supply in each nation, implying a zero excess demand for money. Although this condition must be satisfied in the long run, it may well be violated in the short run, in which case national money markets will exhibit temporary disequilibrium as manifested by excess demands for or supplies of money. When monetary disequilibrium occurs, however, an automatic self-corrective mechanism starts to function as people begin to adjust their cash holdings to bring actual liquidity back into line with desired liquidity.

Money Stock Adjustment Equations The adjustment mechanism mentioned in the preceding paragraph is represented by the model's fifth set of equations, which state that the rate at which each country augments or depletes its cash holdings is proportional to the excess demand for money. These money stock adjustment equations are written as follows:

$$(5) \quad \dot{M} = A(D-M) \text{ and } \dot{M}^* = A^*(D^*-M^*),$$

where $\dot{M}$ is the change in money holdings per unit of time, $D-M$ is excess demand for money (the difference between desired and actual stocks), and A is an adjustment coefficient expressing the speed at which money stocks are adjusted in response to excess demand. The closer the coefficient is to unity the faster the adjustment, and the closer it is to zero the slower the adjustment. In the extreme case where the coefficient has a numerical value of unity, adjustment is sufficiently rapid to eliminate excess stock demand within the same period it occurs. In the opposite case, i.e., a zero coefficient, adjustment never occurs and excess demand persists indefinitely. The model assumes that the

coefficient is large enough to insure that full stock adjustment is eventually achieved. The channel or mechanism through which monetary adjustment is accomplished is, of course, the balance of payments.

Balance of Payments Equation The sixth component of the model is the balance of payments equation, which performs two important functions. First, it specifies the role of the external trade balance in the money stock adjustment process. Specifically, the equation states that the trade balance surplus (the excess of money receipts from sales abroad over monetary expenditures on purchases from abroad) is by definition equal to the country's net change in international reserves and therefore, given domestic credit, in the stock of money itself, i.e., $B = \dot{R} = \dot{M}$. This expression corresponds to the monetary theory of the balance of payments according to which a nation adds to its stock of money by running a trade balance surplus, exporting goods in exchange for money, and reduces its money stock by running a trade deficit, importing goods in exchange for exports of money. The expression also embodies the key monetarist assumption that the policy authorities do not offset or nullify ("sterilize") the impact of payments disequilibria and reserve flows on the domestic money supply.

The second purpose of the equation is to insure that the two-country model is internally consistent by imposing the condition that, for the world as a whole, the sum of the individual trade balances when measured in terms of a common monetary unit is identically equal to zero. This condition means that if the home country is running a trade balance surplus, the foreign country (rest of world) must be running a trade deficit of the same amount when measured in terms of home country currency. Symbolically, the balance of payments identity is $B = -XB^*$, where B is the home country's trade balance surplus and $-XB^*$ is the foreign country's trade deficit (a negative surplus) expressed in units of domestic currency at the fixed exchange rate. This expression, showing how the individual countries are unified via the balance of payments identity, constitutes a mathematical statement of the global monetarist view of the world as a closed system of interdependent open economies.

To summarize, the complete balance of payments equation, expressing both the zero world trade balance identity and the monetary view of the external accounts, is written as follows:

(6) $\quad B = -XB^* = \dot{M} = \dot{R} = -X\dot{M}^* = -X\dot{R}^*.$

Note that since by definition the foreign country's trade deficit measured in terms of domestic currency must equal the home country's surplus, it follows that the money outflow from the former country must also equal the money inflow into the latter. Here is the global monetarist view of the balance of payments as the allocation mechanism that distributes a given total of world money across nations.

Expenditure Equations Completing the model are the expenditure equations that describe the connection between the money market and the commodity market. These equations indicate that in a world in which the public can hold only money and/or goods, an excess demand for one implies a corresponding excess supply of the other and vice versa. Written as follows:

(7) $\quad E = PY - \dot{M}$ and $E^* = P^*Y^* - \dot{M}^*,$

the equations express a relationship between domestic expenditure E (i.e., spending by domestic residents on both home- and foreign-produced goods), nominal income PY, and the rate of accumulation or decumulation of cash balances $\dot{M}$.

According to the equations, spending equals income only when cash balances are not being augmented or depleted, i.e., when the public is just satisfied to hold the existing stock of money. An excess supply or demand for money, however, causes expenditure to deviate from income. For example, an excess demand for cash means that commodity expenditure falls short of income as the public endeavors to build up its cash balance. Conversely, an excess supply of money implies that expenditure exceeds income as the community tries to get rid of its excess cash holdings. Note also that the equations imply a relationship between spending, income, and the trade balance. This corresponds to the monetarist view that the international adjustment process operates primarily through divergences between expenditure and income rather than through changes in the relative prices of exports and imports. The equations imply that when domestic spending for goods exceeds domestic income (production), net commodity imports will fill the gap and the trade balance will be in deficit. Similarly, when domestic expenditure falls short of production, the unabsorbed output will be exported, thereby re-

sulting in a trade surplus. Only if expenditure just equals production will the trade balance be zero.

The Equations Summarized Taken together, the foregoing equations embody the main elements of the monetarist view of the world economy. The equations link the levels of prices, expenditures, and desired and actual money stocks in the two countries as well as the flows of money and goods between them. To summarize, the equations are written as follows:

(1) $\quad P = XP^*$

(2) $\quad D = KPY \qquad D^* = K^*P^*Y^*$

(3) $\quad M = C + R \qquad M^* = C^* + R^*$

(4) $\quad M_w = M + XM$

(5) $\quad \dot{M} = A(D-M) \qquad \dot{M}^* = A^*(D^*-M^*)$

(6) $\quad B = -XB^* = \dot{M} = \dot{R} = -X\dot{M}^* = -X\dot{R}^*$

(7) $\quad E = PY - \dot{M} \qquad E^* = P^*Y^* - \dot{M}^*.$

Equations 1-4 help determine the equilibrium (steady-state) values of the price and monetary variables, while equations 5-7 describe the adjustment mechanism by which equilibrium is restored following a monetary disturbance. Specifically, the equilibrium world price level is determined by equating the world money supply shown in equation 4 with the aggregate world real demand for money implicit in equation 2. Once determined, the world price level is then transmitted to the two countries via commodity arbitrage as described in equation 1. The resulting country price levels enter equation 2 to determine nominal national demands for money. If these latter variables differ from the existing national money stocks shown in equation 3, the discrepancy enters equation 5 to determine the rate of money stock adjustment, which enters equations 6 and 7 to determine national expenditures, trade balances, and the corresponding international redistribution of the world money stock.

Less formally, the model implies the following causal chain:

1. The world stock of money determines the world price level.

2. International arbitrage brings national prices into equality with world prices.

3. National price levels determine national nominal demands for money.

4. National money demands in conjunction with national money supplies determine the rate of money stock adjustment.

5. Money stock adjustment determines spending, trade balances, and the direction and volume of international money flows.

6. This process continues until the equilibrium international distribution of money is achieved, and money market equilibrium is restored in each country. At this point the system is said to be in steady-state equilibrium.

Long-Run Steady-State Solution of the System

In any economic system, the long-run steady-state is characterized by full stock equilibrium, i.e., a situation in which existing asset stocks just equal desired asset stocks. In the hypothetical system described by the model, steady-state equilibrium occurs when the existing stock of money (the sole asset) equals the desired stock. As can been seen from equations 5 through 7, this in turn implies that money stock adjustment, trade balances, and the gap between expenditure and income are all zero. In long-run equilibrium, therefore, equations 5 through 7 are irrelevant, and one can analyze the determination of world prices and their rate of inflation from the first four equations alone.

World Price Level and Inflation Rate A central proposition of global monetarism is that, under a regime of fixed exchange rates, the steady-state path of world prices is determined by the path of the world money stock. A version of the quantity theory of money, this proposition can be demonstrated with the aid of the four equations relevant to the analysis of long-run equilibrium.

The demonstration requires several steps. First, impose the condition of stock equilibrium and set the supplies of money equal to demands, e.g., $M = KPY$. Second, use the fixed exchange rate to express the money stock and price variables as world-level magnitudes. As defined in equation 4, the world money stock is the sum of the national money stocks measured in terms of a single currency, i.e., $M_w = M + XM^*$. Similarly, by virtue of the purchasing power parity assumption, each nation's price level expressed in terms of a common unit is equal to the world price level, i.e., $P_w = P = XP^*$. Note that the assumption of a fixed exchange rate is absolutely indispensable here since it provides the invariable common unit required to convert national variables into a single homogeneous world-level measure that has analytical significance.[2] The third step is to recognize that by choice of an

appropriate unit of measurement for either currency the exchange rate can be set equal to unity, thus permitting the relationship between the world money stock and the world price level to be written simply as $M_w = M + M^* = (KY + K^*Y^*)P_w$. In long-run equilibrium, the variables enclosed by parentheses are regarded as exogenously determined by tastes, technology, and resource endowments, and consequently are taken as given. It follows, therefore, that, in terms of the model, the world price level is fully determined in the long run by the world money stock, with changes in the latter variable causing equiproportionate changes in the former.

Corresponding to the preceding equilibrium money-price relationship is the equilibrium distribution of the world money stock. The home country's natural proportional share or fraction S of world money can be expressed as $S = M/M_w = KY/(KY + K^*Y^*)$, and similarly for the other country (rest of world), whose share, of course, is 1—S. This important result states that, in steady-state equilibrium, the fraction of world money distributed to each nation depends upon the relative importance of the nation's demand for real cash balances as compared with the demands of the entire world. The demand for real balances, of course, is expressed as the product of the desired money/income ratio and real income. Assuming both countries have identical money/income ratios, the country with the greater real income will command the lion's share of the world money stock. As shown below, the distributive share parameters S and 1—S appear in the expression for the world rate of inflation, the derivation of which constitutes the final step of the demonstration.

The expression for the world rate of inflation is derived by taking the time derivative of the logarithm of the world money-price level relationship and is written as $p_w = m_w - [Sy + (1-S)y^*]$.[3] Here p_w is the percentage rate of world inflation, m_w is the percentage rate of growth of the world money stock, y and y* are the exogenously given trend growth rates of real output in the two countries, and S and 1—S are the shares of each country in the world money

---

[2] A flexible exchange rate implies two distinct national money stocks and price levels separated by a variable exchange rate relationship between them, and therefore precludes any meaningful concept of a single world money stock and world price level.

[3] Note that the derivation of this formula requires that the model be reinterpreted to allow for steady-state growth of the relevant variables. Accordingly, the equilibrium magnitudes of the variables are expressed not as absolute dollar levels but rather as constant percentage rates of change.

stock. This equation states that the rate of world inflation is equal to the difference between the world rate of monetary expansion and the growth rate of world output as measured by the sum of the weighted national output growth rates, the weights being the countries' shares in the world money supply. In short, the equation is an exact statement of the monetarist conclusion that inflation results when world monetary expansion outpaces world output growth.

The Dynamic Adjustment Process So much for the determination of the path of world prices in steady-state equilibrium. The next stage of the analysis deals with the international adjustment mechanism as described in equations 5 through 7. Regarding the adjustment process, three questions are especially pertinent. First, what responses are provoked by an autonomous increase in the domestic money supply of a single open economy? Second, how do these responses raise the world price level? Third, how do individual countries subsequently adjust to the higher world price level?

To answer these questions, start from a hypothetical situation of worldwide monetary equilibrium, and let this equilibrium be disturbed by a monetary expansion in the home country. According to the model, this disturbance generates an excess supply of money leading to a trade balance deficit and an excess home demand for goods in the world commodity market, putting upward pressure on world prices. The resulting world price increase, disseminated abroad via the international arbitrage mechanism, induces corresponding changes of opposite sign in the demand-for-money, stock-adjustment, expenditure, and trade-balance equations of the foreign country.[4] Adjustment continues until both monetary redundancy in the one country and monetary deficiency in the other are eliminated. When equilibrium is restored, world and national price levels will have risen in proportion to the rise in the world money supply.

The preceding corresponds closely to the monetarist interpretation of the worldwide inflation of the late 1960's and early 1970's. According to this view, excessive monetary expansion in the

U. S. generated a persistent excess demand for goods and consequently a series of balance of payments deficits that pumped dollars into the international monetary system in sufficient quantities to contribute significantly to global inflation. This view departs from the model only in one key respect. It contends that, because the dollar itself constituted the primary international reserve asset, the U. S. was able to engage in domestic credit expansion that led to the inflationary rise in world liquidity without suffering a loss of its own reserves. Lacking an external reserve constraint, the U. S., in this view, became a potentially potent source of world inflation.

Policy Implications of the Model The model described in the preceding paragraphs contains some radical implications for economic stabilization policy. These implications can be classified according to whether they pertain to small or to large open economies. Small economies are those whose domestic policy actions can be treated as having a negligible impact on the rest of the world. Large economies, by contrast, are those whose policies have a significant global influence. In some cases—e.g., the United States—an economy may be so large as to warrant interpretation as a closed economy. In what follows it is also well to remember that the often unconventional conclusions derived from the model reflect the particular assumptions underlying it, and that many of these assumptions are open to serious criticism. This is especially true of the assumptions of (1) full employment, (2) perfect international arbitrage, (3) exogeneity of real income, (4) nonsterilization of international money flows, and (5) the existence of an inherently stable self-regulating world economy. While these assumptions may hold in long-run equilibrium, empirical evidence suggests that they may not hold over any realistic current policy-making horizon nor over the transitional adjustment period following monetary shocks. Recognition of this fact would certainly modify—perhaps drastically—any policy prescriptions based on the model. Subject to these caveats, the policy implications of the model are summarized below.

Small Country Implications The first and most radical implication stemming from the model is that, in the case of small open economies operating with fixed exchange rates, traditional macroeconomic monetary and balance of payments policies are both unnecessary and useless. They are

---

[4] The rise in world prices also affects the home country, reducing but not eliminating the excess supply of money there. This latter result follows from the fact that world prices rise in proportion to the world, not the national, money stock. Since the home country's stock is but a fraction of the world stock, a given percentage change in the former corresponds to a smaller percentage change in the latter, and therefore in the world price level. In short, world prices will not rise sufficiently to eliminate the initial excess supply of money in the home country. The redundant money must be gotten rid of through the balance of payments.

unnecessary because the international adjustment mechanism works automatically to correct economic disequilibria and to provide each country with sufficient money to accommodate full capacity levels of output. They are useless because the domestic authorities cannot control the money supply or the balance of payments, both of which are endogenous variables determined by the public's demand for money.

Suppose, for example, the authorities try to improve the country's balance of payments by devaluing the currency, i.e., engineering a one-time increase in the pegged exchange rate. This devaluation has no permanent impact on the trade balance. There is, to be sure, a favorable *short-run* impact, but this impact is inherently transient as can be seen by tracing the sequence of events triggered by the policy action. First, the devaluation causes a step increase in the exchange rate. Given the foreign price level, however, the home price level must immediately rise in the same proportion as the exchange rate to preserve purchasing power parity. The domestic price increase raises the stock of cash balances demanded by the public. This generates an excess demand for money, leading to a reduction in expenditure and to a trade balance surplus. The surplus, however, is short-lived, since it is accompanied by an inflow of money that eventually eliminates the discrepancy between actual and desired cash balances. When this happens, the adjustment process ceases, domestic spending again equals production, and the trade balance surplus vanishes. The sole long-run effect of the devaluation is on the price level which, according to the demand for money equation, rises in exact proportion to the increase in the domestic money supply. Within the context of the example, the authorities are powerless to exercise permanent control over the balance of payments.

The only thing the monetary authorities can control in a small open economy is the *composition* of the money supply, i.e., the mix between domestic credit and international reserves. They cannot, however, govern the size or total quantity of the money supply. For according to the monetary theory of the balance of payments, an expansion in the controllable domestic credit component of the money stock will result in a balance of payments deficit and an outflow of the uncontrollable international reserve component until the money stock returns to its initial level. When equilibrium is restored, the mix of the money stock will be changed—domestic credit having

displaced international reserves dollar for dollar —but the total will be unaltered. This conclusion follows directly from the model as can be seen by setting the money supply equation equal to the money demand equation to yield $C + R = KPY$. Given the long-run equilibrium values of the variables on the right-hand side of this equation, it follows that any change in the domestic credit component C must be offset by a change identical in size but opposite in sign in the international reserve component R to keep the total money stock equal to the unchanged steady-state demand for it. In short, the total stock of money is no more a controllable variable than is the balance of payments in a small open economy.

A second policy implication is that, assuming the absence of monetary contraction abroad, a nation's monetary authorities are solely to blame for its balance of payments deficits, since there can be no deficits unless there is an excess supply of money. It should be noted, however, that such deficits are inherently transitory phenomena. For the model predicts that they will vanish as soon as the redundant money is diffused throughout the world economy by the operation of the international adjustment mechanism.

A third policy implication is that, in a world of fixed exchange rates, a small open economy can control neither its price level nor its rate of inflation, since both are determined in world markets. This means that an individual country will find it impossible to avoid inflating at the world rate. It also means that in a fixed exchange rate system all national inflation rates must eventually converge. This latter conclusion can be demonstrated by taking the time derivative of the logarithm of the purchasing power parity equation. This operation yields the result $p = x + p^*$ where p and p^* are the percentage rates of price inflation in the home and foreign country, respectively, and x is the percentage rate of change of the exchange rate. This result states that rates of inflation in the home country and the rest of the world can differ only by the proportional rate of change of the exchange rate. In a system of fixed exchange rates, however, the latter variable is zero and therefore the two inflation rates must converge. In short, with fixed exchange rates, countries cannot continually inflate at different rates.

A fourth policy implication, therefore, is that if a country wishes to choose its own inflation rate independent of the rest of the world it must operate with a flexible exchange rate. By

letting its currency float, a country can gain control over its money supply and hence its rate of inflation. The logic behind this conclusion is straightforward. Floating exchange rates operate to maintain continuous equilibrium in a country's external accounts, thereby obviating the need for international money flows. It follows, therefore, that increases in the domestic money stock, instead of being diffused abroad through the balance of payments, will remain at home to induce equiproportional rises in the domestic price level. Note that the adjustment mechanism in the floating rate case differs markedly from that of a fixed rate regime. In the latter, money market equilibrium is restored by *quantity* adjustments, namely, international flows of money. In the former case, however, stock equilibrium is restored by *price* adjustments, namely, changes in the domestic price levels. To summarize, with the exchange rate floating so as to equilibrate the balance of payments, a nation's money stock becomes an exogenous variable which the authorities can control to achieve any rate of inflation they desire.

If a floating exchange rate permits a country to determine its own rate of inflation, then it also insulates that country from inflation originating abroad. Thus when a foreign nation inflates its money supply while the home country holds its currency constant, the resulting rise in the foreign price level will be offset by an equiproportional fall in the exchange rate, leaving domestic prices unchanged. Note, however, that this conclusion has an important corollary, namely, that under a flexible exchange rate a country must suffer the full consequences of its inflationary policies since it cannot export its inflation abroad.

It would be wrong to conclude from the above arguments that monetarists believe that flexible exchange rates are inherently superior to fixed rates. On the contrary, many monetarists are opposed to floating rates for at least two reasons. First, floating rates eliminate the risk-pooling and efficiency advantages of international money associated with fixed rates. Second, volatile exchange rates between currencies would tend to reduce the effectiveness of money as a social institution for economizing on the use of scarce resources in the production and dissemination of economic information.

It is on the basis of such arguments that some monetarists—e.g., Robert A. Mundell and Arthur Laffer—urge the restoration of a system of fixed exchange rates, with the rate of world monetary expansion being regulated by a world central

bank. By contrast, other monetarists such as Milton Friedman, Harry G. Johnson, and David Laidler, while agreeing that volatile exchange rates introduce risk and inefficiency into the international economy, do not believe that a regime of institutionally fixed exchange rates is necessarily the best solution. According to these latter monetarists, floating rate volatility stems from domestic monetary policies that are erratic, variable, and divergent as between countries. This volatility, it is claimed, would be eliminated if all countries abandoned discretionary countercyclical monetary management for fixed monetary rules. The adoption of rules calling for a constant rate of domestic monetary expansion equal to the trend growth rate of real output supposedly would make the flexible rate virtually as stable as a rigidly fixed rate. Moreover, flexible rates have the added advantage of being determined by market forces, thus freeing governments to use their policy instruments in pursuit of purely domestic objectives.

It is apparent from the above that while monetarists agree that exchange rate stability is necessary for an efficiently operating international economy, they disagree on the question of the most appropriate exchange rate regime. This disagreement is not as important as it appears, however, since all monetarists acknowledge that the key to exchange rate stability lies less in the way the foreign exchange market is organized than in finding a means of coordinating national monetary policies. True, the policy coordination problem has not been solved, although many solutions have been proposed (including the above-mentioned proposals of rules and a world central bank). But if and when it is solved, the exchange rate—whether fixed or floating—will be stable. And once the exchange rate is stabilized, inflation will again be an international rather than a national problem. This is because a stable rate of exchange between national currencies makes the sum of those currencies an economically relevant aggregate and also implies that national inflation rates will converge on a common (world) level.

Large Country Implications The policy implications discussed in the preceding paragraphs refer to small open economies. As pointed out earlier, however, the implications are substantially different when the individual country is large relative to the rest of the world. The main difference concerns the ability of a country to control its own

inflation rate under a system of fixed exchange rates. As noted earlier, in a fixed rate regime an individual country's domestic monetary expansion will affect its price level only indirectly by influencing the world money supply and the world price level. The strength of this influence is in direct proportion to the relative economic size of the country as measured by its share of the world money supply. For an individual small country this share is negligible and therefore so is the country's ability to influence its own price level. In sharp contrast, a large country's money stock forms a substantial proportion of the world money stock such that an expansion in the former stock will result in a significant expansion in the latter and, therefore, in the world and national price levels. Because of its size, the large country is able to indirectly regulate its own money stock and price level even in a world of fixed exchange rates. In this sense, a large country's money stock becomes an exogenous variable and its price level an endogenous one, which is just the reverse of the case for small countries.

Apart from sheer size, there is a second reason why a large country may be able to control its money supply even in a fixed rate regime. The country may be a *reserve currency country*, i.e., one whose currency is held by other countries as a form of international reserves. As previously mentioned, in a fixed rate world with no reserve currency country, nations can control the composition but not the quantity of their individual money stocks. According to the monetary theory of the balance of payments, an expansion in the controllable domestic credit component of a nation's money stock will result in a balance of payments deficit and an outflow of the uncontrollable international reserve component until the money stock returns to its initial level.

In the case of a reserve currency country, however, an expansion in the domestic credit portion of the money supply need not lead to an offsetting contraction in the international reserve component if the rest of the world holds its increased reserves in the form of government securities issued by the reserve currency country. Although the country runs a balance of payments deficit as a result of its domestic monetary expansion, its status as a reserve currency country enables it to effectively neutralize the impact of the payments deficit on its money supply. Thus despite the deficit, the authority is able to achieve an expansion of the money supply. Apparently such was the case in the late 1960's and early

1970's when the reserve currency status of the dollar enabled the U. S. to expand its money stock in the face of large external deficits. This latter experience indicates that the reserve currency case constitutes an important exception to the monetarist prediction that payments deficits tend to be accompanied by reductions in the nation's money stock.

Summary This article has expounded the global monetarist explanation of inflation within the framework of a simple two-country model that links national price levels, money stocks, money flows, spending, and the balance of payments. The model can account for the generation of world inflation under fixed exchange rates, for the transmission of that inflation to individual national economies, and for the distribution of world money necessary to support it in each nation. Typically monetarist, the model stresses the role of the demand for money in determining both the steady-state path of world prices and the dynamic adjustment to that path. The model also yields the standard predictions of the quantity theory, namely equiproportionality of money and prices, long-run neutrality of money, and the equilibrium international distribution of money. Moreover, it embodies the global monetarist conception of the international economy as a stable self-regulating mechanism in which monetary and payments disequilibria are inherently transitory phenomena. Finally, the model provides a framework for stating clearly the macroeconomic policy problems confronting small open economies.

References

1. Branson, William H. "Monetarist and Keynesian Models of the Transmission of Inflation." *American Economic Review*, 65 (May 1975), 115-19.

2. Claassen, Emil M. "World Inflation Under Flexible Exchange Rates." *Scandinavian Journal of Economics*, 78, No. 2 (1976), 346-65.

3. Dornbusch, Rudiger. "Devaluation, Money, and Nontraded Goods." *American Economic Review*, 63 (December 1973), 871-80.

4. Mundell, Robert A. *International Economics.* New York: Macmillan, 1968.

5. —————. *Monetary Theory: Inflation, Interest, and Growth in the World Economy.* Pacific Palisades: Goodyear, 1971.

6. Swoboda, Alexander K. "Monetary Approaches to the Transmission and Generation of Worldwide Inflation." Geneva: Graduate Institute of International Studies, 1975. (Mimeographed.)

7. Whitman, Marina v.N. "Global Monetarism and the Monetary Approach to the Balance of Payments." *Brookings Papers on Economic Activity*, 6, No. 3 (1975), 491-536.