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MONETARY POLICY IN AN OPEN ECONOMY

by

James R. Melvin

August, 1970

## MONETARY POLICY IN AN OPEN ECONOMY\*

In the last number of years economists have devoted a considerable amount of attention to the relative effectiveness of monetary and fiscal policy under alternative exchange rate systems and under various assumptions about the mobility of capital.<sup>1</sup> Two related conclusions are usually derived from this literature. The first is that monetary policy is more effective under flexible rates than under fixed rates, while fiscal policy is more effective under fixed rates than under flexible rates, and second, that under a fixed exchange rate system, monetary policy tends to be ineffectual because of the difficulty of pursuing an independent interest rate policy.

The usual explanation of how monetary policy works in an open economy depends crucially on the effect of a monetary action on the interest rate. We will argue that because of a direct effect of monetary policy on the level of income, the direction in which a monetary action will tend to change interest rates is not clear, so that the interest rate effect of a monetary change is ambiguous. It will also be shown that attempts by the monetary authorities to change the level of the rate of interest without

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<sup>1</sup>The seminal work is that of Robert A. Mundell, "Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates," Canadian Journal of Economics and Political Science, XXIX (Nov. 1963). For one of the recent contributions see Akira Takayama, "The Effects of Fiscal and Monetary Policies under Flexible and Fixed Exchange Rates," Canadian Journal of Economics, II (May 1969). See footnote 1, ibid., for a bibliography of some of the major contributions in this area. Throughout our discussion we will refer to the papers by Mundell and Takayama, but most of our comments would apply to the other contributions to the literature as well.

changing the stock of money, cannot in general, be expected to influence the level of income. It will be argued, however, that regardless of the interest rate effect, a monetary change will have an important influence on the level of income under either fixed or flexible exchange rate systems. An important qualification to these results is that with perfect capital mobility, defined to mean perfect substitution between domestic and foreign securities, it may not be possible to change the money supply through open market operations.

Almost all the analysis of monetary policy in an open economy has been concerned with the unemployment problem and has assumed that increases in output can be achieved without price increases. The facts of the last few years, however, have demonstrated that inflation can be a major economic issue as well. In Section IV some of the general implications of an inflationary situation for an open economy will be discussed.

#### I. The Monetary Expansion Process

The major point on which the arguments of this paper rest is that the process through which a money supply change is generated can have a direct effect on the level of income. It should be made clear at the outset that we do not mean to imply that the direct effect we will describe is the only effect of a change in the money supply. It is not our intention to dispute the validity of the traditional explanation of how monetary policy works. It would seem, however, that the direct effect which we wish to emphasize may add a useful component to the overall explanation of how a monetary change affects the economy; a component which does not seem to have received the attention it deserves. If, throughout the paper, an inappropriate amount of attention seems to be given to our so-called "direct effect," it is

because there is clearly no need to review the well known traditional arguments.<sup>2</sup>

We will initially assume the traditional kind of Keynesian world where there are enough unemployed resources so that output can be increased without giving rise to price increases. In a subsequent section we will consider the implications of our analysis for the inflation problem. We will abstract from taxes and assume that all individuals have a marginal propensity to consume of .8 and a marginal propensity to save of .2. We will begin by considering a completely closed economy so that we can present our basic argument in its most simple form.

We will now suppose that there is an increase in the money supply, and in order to avoid, for the time being, the complications introduced by open market operations, we will assume that the money supply increase is generated by a reduction in the legal reserve ratio that the commercial banking system is required to maintain.<sup>3</sup> Specifically we will assume that enough excess reserves are created to allow the commercial banking system to make additional loans in the amount of 100 dollars, and we will suppose that such loans are made. We now change focus slightly and concentrate not on the economic unit making the loan, but rather on the individual or firm that borrowed the money. Specifically we are concerned with what happens to this 100 dollars. We can, of course, think of a wide variety of reasons why money would be borrowed, but whatever the

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<sup>2</sup>For a full discussion of the argument sketched in this section, and their implications for the income determination process, see James R. Melvin, "Monetary Policy, Consumer Debt, and the Determination of National Income," (mimeographed). For an earlier paper which stressed the direct effect of a monetary change on the level of income see George Horwich, "Money, Prices and the Theory of Interest Determination," Economic Journal, 67 (December 1957).

<sup>3</sup>We recognize that open market operations are, in practice, the only monetary tool used to control the money supply. However, such operations have a direct effect on interest rates which, for the moment, we want to abstract from.

reason it seems safe to assume that it will be spent, and in most cases spent almost immediately. While it is possible to imagine situations in which money would be borrowed to hold idle, we would not expect this to be the normal situation.

While all this may seem obvious it nevertheless appears to be a point which has not been emphasized in the analysis of the monetary expansion process. A loan will, in general, result in an increase in expenditure. Expenditure, it must be noted, which would otherwise not have taken place. This increase in expenditure is in no fundamental way different from an increase in government spending or the increase in expenditure which an increase in investment implies.<sup>4</sup> The spending of the 100 dollars will begin an income expansion process, and with our assumption that the marginal propensity to spend is .8, in the final equilibrium 500 dollars of income will have been generated. The point is that 100 dollars of expenditure is 100 dollars of expenditure and it makes no difference whether it was 100 dollars of government deficit-finance spending or 100 dollars which was borrowed from the commercial banking system.

To this point, then, we have shown that the initial loan of 100 dollars will, when spent, begin a multiple expansion of income. But our story has just begun for we know from the traditional explanation of the monetary expansion process that the original loan of 100 dollars will soon be deposited in the banking system, on the basis of which another loan can be made, the amount depending on the legal reserve ratio. If the reserve ratio is 10 per cent then a 90 dollar loan will be made, which we can again

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<sup>4</sup>It is quite possible, of course, that the borrowers described above may be firms in which case the spending we have been discussing may be investment.

assume will be spent, and another expansion process will begin. And of course each time a loan is made an income expansion process is begun, and by the time the money supply has fully increased 1,000 dollars will have been spent and this, through the multiplier process, will result in a 5,000 dollar increase in national income.<sup>5</sup> And recall that all this began with the initial loan of 100 dollars.

Before proceeding two important qualifications to the simple analysis described above must be made. The first is that even if we assume that all banks are always fully loaned up, it is certainly not necessary that all excess reserves will be used to make loans to individuals or firms. Indeed we would expect that some proportion of these reserves would be used to purchase government securities, for there is no a priori reason to believe that the banks will change the proportion of loans and government securities that they hold in their asset portfolios. Indeed in the initial situation we might expect banks to channel more than the equilibrium amount of funds into securities until sound loans can be negotiated.<sup>6</sup> The second qualification is that we would not, in general, expect all loans to be spent on newly produced goods and services, for some people may buy used cars or old paintings. Of course this is equally true for any multiplier process.

## II. The Money Supply and the Interest Rate

The main point of the last section was that any increase in the money supply can have a direct and multiple effect on the level of national income. The making and spending of loans was seen to be the mechanism through

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<sup>5</sup>As mentioned earlier, this assumes that all loans are spent, and this assumption will be maintained throughout our analysis.

<sup>6</sup>We will have more to say about this possibility in the next section.

which this income expansion occurred, but so far we have not considered the question of to whom these loans are made. This question is relevant for a number of reasons. The traditional Keynesian explanation of the effect of an increase in the money supply maintains that a money supply increase prompts commercial bankers to lower interest rates, which in turn generates a higher level of investment spending and consequently a higher level of national income. Our analysis, however, has drawn attention to the fact that, regardless of who the borrowers are, the lending which allowed the money supply to increase is the same lending which, when spent, caused income to rise. One does not increase the money supply, then lower interest rates and then loan money, for once the money supply has increased no more money is available to be borrowed. The process which begins the income expansion chain is the same process which increases the money supply.

There are two ways in which the traditional analysis can be made consistent with our observations. The first is to interpret the traditional explanation to mean that there is first an increase in the monetary base, then a reduction of interest rates, an increase in loans and a consequent increase in investment spending and thus income. In this case the money supply will increase as the loans are made.<sup>7</sup> Insofar as there is a lag between the time interest rates are reduced and the time when investors respond, as several empirical studies have suggested,<sup>8</sup> then, if the money

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<sup>7</sup>Although this may be what textbook writers mean they are not always careful to make this clear. For example in Paul A. Samuelson, Economics, seventh edition (New York: McGraw-Hill Book Company), pp. 298-9, a five step process is described in which the second step is the change in the money supply and the fifth step is the change in income.

<sup>8</sup>As two examples, see J. Kareken and R. M. Solow, "Lags in Monetary Policy," Commission on Money and Credit, Stabilization Policies (Englewood Cliffs, N.J., 1963), and T. C. Liu, "An Exploratory Quarterly Econometric Model of Effective Demand in the Postwar U.S. Economy," Econometrica, 31 (July, 1963).



supply is increased through making loans, there will be a corresponding lag in the increase in the money supply and banks will be observed to hold excess reserves in the interim. Of course in practice we would not expect banks to hold idle balances, and in this interim securities will be purchased. Indeed, as an extreme case, we can imagine that no loans are made and that all excess reserves are used to purchase securities. And as long as the security sellers deposit this newly acquired money in the commercial banking system, there is no reason why the entire monetary expansion process could not be accomplished in this way.

This possibility raises an interesting point which deserves brief attention. Observe that insofar as excess reserves are used to buy securities they are not available for making loans, and if securities are purchased at all stages of the monetary expansion process then no loans can be made, for once the money expansion process has been completed, banks are fully loaned up.<sup>9</sup> This means that there can be no expansionary effect on income of the Keynesian variety, although there will, in general, be liquidity and portfolio effects. Of course even if initially a large proportion of the new assets of the commercial banks are securities, we would not expect this to be an equilibrium situation, for in general loans will be more profitable. The important implication is that the speed at which the commercial banks reach a new equilibrium on the asset side will determine the length of time it takes monetary policy to affect the level of national income. It is perhaps not unfair to suggest that in discussions of monetary policy, not enough attention has been paid to the importance of changes in the composition of the assets of the commercial banks.

There is another means by which monetary action can have an

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<sup>9</sup>The purchase of securities will lower interest rates, but this will be of significance for borrowers only if the banks have money to lend.

influence on the level of national income which we would expect to operate with virtually no lag. An examination of the assets of any commercial bank will show that a substantial proportion of their loans are made to consumers, and a large proportion of such loans will be used to purchase new goods and services.<sup>10</sup> Such loans can be negotiated very quickly, and in recent years at least, there would seem to have been no shortage of individuals willing to take out such loans, even at very high interest rates. Thus there need be virtually no lag between the time the bank acquires excess reserves and the time that the influence on national income is felt. And if the level of such loans is determined by rationing, rather than through interest rate changes, then we would not expect such loans to influence the interest rate at which they are made.<sup>11</sup> Thus when commercial bankers find themselves with excess reserves they may simply make loans which they otherwise would not have made, and when downward pressure is applied to reserves they may restrict loans by becoming somewhat more concerned about collateral and about the way the loan will be used.

Two conclusions can be drawn from the analysis to this point. The first is that regardless of who borrows the money, any increase in the money supply accomplished through the making of loans will in general be expected to have a direct effect on the level of national income. The magnitude of this direct effect will be equal to the amount of loans made.<sup>12</sup>

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<sup>10</sup>I have suggested elsewhere that consumer debt may be an important determinant of the level of national income. See James R. Melvin, "Monetary Policy, Consumer Debt, and the Determination of National Income," (mimeographed).

<sup>11</sup>One indication that this may be the case is the stability of consumer loan rates. This argument is closely related to the availability doctrine. For a summary of this literature see Franco Modigliani, "The Monetary Mechanism and its Interaction with Real Phenomena," Review of Economics and Statistics, 45 (February 1963) supplement.

<sup>12</sup>It is possible that borrowers will use the loans to buy securities rather than purchasing newly produced goods and services. This will clearly have the same effect as if the commercial banks had bought the securities.

Thus if monetary action is to be effective in increasing income it must increase loans. Our second conclusion is that a monetary action to control inflation by putting downward pressure on national income must do so by reducing credit, for only in this way can the level of expenditure be reduced. Attempts by the central bank to change interest rates, through changing the discount rate for example, cannot be expected to directly influence the level of national income. Monetary policy cannot, in general, operate by changing the interest rate unless such changes are accompanied by money supply changes which, in turn, change the level of loans.<sup>13</sup> Thus interest rate changes should not be regarded as an unambiguous reflection of the effects of monetary policy.<sup>14</sup> And since, in some circumstances at least, the money supply can be changed without changing the interest rate, the inability of monetary authorities to change the interest rate should not be regarded as meaning that monetary action cannot be pursued.

Another important issue, at least for the purposes of our analysis, is whether a change in the money supply should be expected to change the interest rate. This question has two parts. The first is whether, when commercial bank reserves are increased and more loans made, the interest rate will rise, and the second is whether open market operations, the most common method of manipulating commercial bank reserves, will affect the interest rate through their operations in the bond market.

We have argued that changes in the money supply, through changing the level of loans, and thus the level of spending, have a direct effect on

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<sup>13</sup>If investors are more sensitive to interest rate changes than consumers, then an increase in interest rates would be expected to shift expenditure from investment to consumption and consequently reduce the growth rate. Again we are abstracting from portfolio effects.

<sup>14</sup>We will present more evidence on this point in the next section.

national income. In terms of the traditional IS-LM diagram this means that not only does a money supply increase shift the LM curve to the right, it shifts the IS curve to the right as well.<sup>15</sup> In Figure 1  $IS_0$  and  $LM_0$  are the original curves and  $IS_1$  and  $LM_1$  the curves after the increase in the money supply. As expected, national income has increased, in this case from  $Y_0$  to  $Y_1$ , but in the particular situation shown in Figure 1 the interest rate has also increased. This result is, of course, a consequence of the way we have drawn the diagram, and is by no means a necessary result. The point is that unless we know how much a money supply increase shifts both curves we have no way of knowing whether the interest rate will rise or fall. And knowing how much the IS curve will shift depends on knowing how much of a money supply increase is accomplished through the making of loans which are used to purchase newly produced goods and services.

The second way in which monetary action initiated by the central bank is assumed to influence the interest rate is through the direct action of open market operations on bond prices and thus on their rates of return. It is certainly clear that if, other things being equal, the central bank goes to the bond market to buy bonds, in order to induce the private sector to part with some of its bond holdings the price of bonds will have to be bid up, which will tend to reduce the rate of return. Of course whether or not bond prices will actually change will depend on the other side of the market as well. There may, for example, be forces acting on the public's demand for bonds which would tend to offset this change. Or more importantly from our point of view, it may be that the existence of perfect substitutes for domestic government securities will prevent bond prices from changing.

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<sup>15</sup> Observe that the shift in the IS curve brought about by the increase in the money supply is a temporary one, and unless the increase is repeated in the next period the IS curve will shift back to its original position. Thus increases in the money supply affect the IS curve in exactly the same way as do increases in investment.

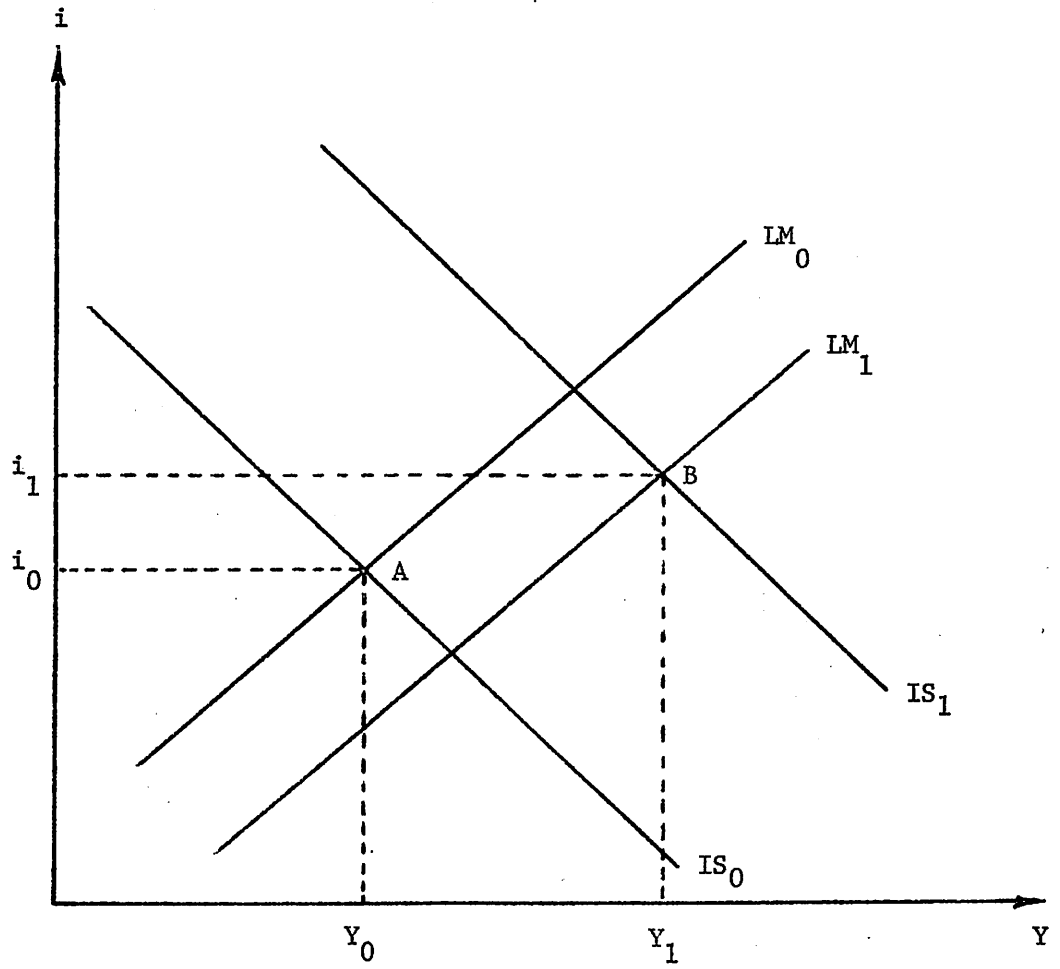


Figure 1

Thus if initially there is equilibrium, if the monetary authorities enter the market, say to buy bonds, any small increase in the price of bonds will induce the public sector to sell bonds and buy the substitute; foreign securities, for example. In such a situation open market operations would not be expected to influence the price of bonds, i.e., would not be expected to change their rate of return.<sup>16</sup>

### III. Implications for an Open Economy

We now turn to the question of what implications these results have for the analysis of the effect of monetary policy in an open economy with perfect capital mobility. In the last two sections we have been particularly concerned with the role of the interest rate in the monetary expansion process. The reason for this emphasis is the crucial role which modern analysis of the open economy gives to the interest rate. For example, in Mundell's explanation of how monetary and fiscal policy operate in an open economy, the effects on national income are seen to be due to capital flows which are induced by the interest rate changes which result from open market operations.<sup>17</sup> In the flexible exchange rate case expansionary monetary policy puts downward pressure on interest rates, induces a capital outflow which depreciates the exchange rate, causes an export surplus, and thus increases national income. Under fixed exchange rates the pressure on the interest rate causes a capital outflow which worsens the balance of payments. To prevent a fall in the exchange rate the monetary authorities buy domestic currency which offsets the initial increase in the money supply. Monetary policy is, by Mundell's argument,

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<sup>16</sup> A much more important implication of the perfect-capital-mobility assumption for open market operations will be discussed in the next section.

<sup>17</sup> Mundell, "Capital Mobility and Stabilization Policy," op. cit. See also Takayama, "The Effects of Fiscal and Monetary Policies," op. cit. Throughout our discussion the word "capital" refers to money capital.

effective under flexible rates but not effective under fixed rates. Furthermore it is clear that both arguments depend crucially on the effect that monetary policy has on the interest rate.

To assess these arguments in terms of our analysis it is again convenient to treat separately the two ways in which monetary action could affect the interest rate. Although the direct effects on the interest rate of an open market operation are not explicitly considered in most of the literature which deals with monetary policy in an open economy,<sup>18</sup> these effects would seem to be of some significance and so we will consider them first.

We will assume that the monetary authorities are attempting to exert expansionary pressure on the economy through an open market purchase of domestic government securities. The aim of this operation is to increase the level of high powered money so that a multiple expansion of the money supply can take place. In a closed economy such an action would, other things equal, tend to bid up the price of securities and lower the interest rate. However, in an open economy with perfect capital mobility, which "can be taken to mean that all securities in the system are perfect substitutes",<sup>19</sup> the upward pressure on bond prices will cause an outflow of funds, i.e., will result in an increase in the purchase of foreign securities, and if the supply of these foreign securities is perfectly elastic there will be no change in the interest rate. But if domestic interest rates do not change we have a problem in explaining why the money supply should increase, for with interest rates the same as before there seems to be no good reason for assuming that domestic economic units will increase the amount of money and reduce the amount of bonds that

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<sup>18</sup>Neither Mundell nor Takayama explicitly consider the direct effects of an open market operation in a perfect capital market situation.

<sup>19</sup>Mundell, "Capital Mobility and Stabilization Policy," op. cit., p. 475.

they hold in their portfolios.<sup>20</sup> It is certainly possible for the central bank to buy bonds, but with interest rates unchanged, all that the private sector is doing is giving up domestic securities and buying foreign securities. In such a situation there is no increase in high powered money and consequently no change in the money supply. An open market operation will increase the money supply only if it succeeds in substituting money for securities in the public's portfolio, and in this case the public has simply substituted one kind of security for another. In other words, an open market purchase of domestic securities will have exactly the same effect as would a purchase of foreign securities in the foreign securities market.

While in this example the action of the monetary authorities has not changed the money supply it has resulted in an outflow of capital.<sup>21</sup> Under a flexible exchange rate system this will produce a deficit in the balance of payments and the exchange rate will depreciate, which will tend to improve the balance of trade, and consequently will have an expansionary effect on national income.<sup>22</sup> In terms of the IS-LM diagram the IS curve will shift to the right. This, however, will put upward pressure on the interest rate, which will result in a capital inflow which will cause a balance of payments surplus, appreciate the exchange rate, and put contractionary pressure on national income. Since the money supply has not changed this will continue until the original level of national income has been re-established.<sup>23</sup> Thus in these

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<sup>20</sup> An open market purchase of securities increases the amount of high powered money by inducing people to exchange bonds for money. In our initial examples, no such change in portfolios was necessary since the increase in high powered money came from a reduction in legal reserve requirements.

<sup>21</sup> The mechanisms described here whereby a capital flow will influence the level of income are due to Mundell, op. cit.

<sup>22</sup> For a set of circumstances where an outflow of funds will not have an expansionary effect on the economy, see James R. Melvin, "Capital Flows and Employment under Flexible Exchange Rates," Canadian Journal of Economics, I (May, 1968), 332-3.

<sup>23</sup> This discussion makes the implicit assumption that it is appropriate to consider that the rate of return on bonds and the interest rate as determined by the IS-LM curves are always equal.



circumstances monetary policy has no effect on the level of national income. This presents a sharp contrast to Mundell's conclusions.

Under a fixed exchange rate regime the outflow of capital will put downward pressure on the exchange rate, and to prevent a fall in the rate the central bank will sell foreign exchange and buy domestic currency. This will reduce the domestic money supply and put downward pressure on the level of national income. Thus under fixed rates the open market purchase of securities has resulted in a reduction in the money supply rather than an increase, and in this case monetary policy is perverse.

The rather startling results we have just described depend, first, on the assumption that there is perfect capital mobility, and second, on the assumption that the substitution in domestic portfolios is between foreign and domestic securities. The more usual results can be derived if we introduce the possibility that domestic savings accounts are also perfect substitutes for domestic government securities, and that when the price of domestic securities begins to rise, there is a switch out of bonds and into savings accounts. This, of course, will allow the money supply to increase and will not result in an outflow of capital. It should be noted that all of the popular discussions of monetary policy in a perfect-capital-mobility world assume that the money supply can be increased through an open market purchase of bonds, but none of these discussions explain exactly how this is accomplished. It is clear, however, that some assumption such as the one we have made must be implicit in their discussions, for otherwise the analysis they present cannot be derived. Of course in general we would not expect either of these two extremes to describe the behavior of the economy, for domestic securities will tend to be substitutes for both foreign securities and domestic savings accounts. What is important is the extent to which open market operations result in purely domestic transactions for this will determine the extent to which monetary policy is effective.

Because the situation in which the monetary authorities can change the money supply would seem to be of more interest than the case in which they cannot, we will hereafter assume that in the domestic securities market, the assets which are perfect substitutes are domestic bonds and savings accounts in commercial banks. It is, however, worth stressing the fact that if there is perfect capital mobility, and a large enough foreign capital market so that domestic policy does not affect the world interest rate, then if substitution takes place only between foreign and domestic securities, under flexible exchange rates open market operations will not affect the money supply, and under fixed rates the effect will be perverse.<sup>24</sup> We can now go on to discuss the implications of money supply changes for the open economy.

Our analysis of the previous section suggested that there was no a priori reason to expect the interest rate to move in one direction rather than in the other when the money supply is increased. This being the case, there can be no presumption as to whether monetary policy will result in a capital outflow or a capital inflow, and thus we will not know in which direction the capital flow is changing national income. But observe that this does not mean that we do not know how monetary policy is affecting the economy. For example, consider Figure 1 where the initial effect of a monetary expansion has been to raise interest rates. With an open economy and perfect capital mobility this interest rate increase would have been prevented by a capital inflow. With flexible exchange rates this capital inflow would have appreciated the exchange rate, imports would rise, exports fall and the IS curve would have shifted leftward until the initial interest rate had been re-established. In the final equilibrium income will have increased, but not by as much as it would have in a closed economy. Of

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<sup>24</sup>This applies only to open market operations and not to changes in reserve requirements or to the printing of new money.

course, this argument depends on the relative initial shifts of the IS and LM curves, and if in the closed economy  $i_1$  had been below  $i_0$  then just the opposite would have occurred, and in the open economy income would have increased by more than in the closed economy.

Now suppose that in Figure 1 exchange rates are fixed. When the exchange rate begins to appreciate, the central bank, in order to stabilize the exchange rate, will sell domestic currency and buy foreign exchange. This will further increase the money supply and will shift the LM curve to the right until  $i_0$  is again re-established, and the change in national income will be greater than that shown in Figure 1. Again, this conclusion depends on the initial relative shifts of the LM and IS curves, and the opposite result would be observed if initially the interest rate had fallen.

We can conclude, then, that if the central bank is able to induce the public to change the structure of its portfolio and hold more money (savings accounts) and less bonds, then the increase in the money supply will increase national income regardless of whether exchange rates are flexible or fixed. However, the relative effectiveness of monetary policy will depend on whether fixed or flexible exchange rates prevail. But we will not know whether monetary policy will be more effective under fixed rates than under flexible rates unless we know the relative shifts of the IS and LM curves which were brought about by the change in the money supply. The change in national income induced by the capital flow may be contractionary but will never be large enough to offset the initial change in income due to the money supply increase. Thus monetary policy will always be effective under either fixed or flexible exchange rate systems.<sup>25</sup>

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<sup>25</sup> These conclusions assume that open market operations can change the money supply.

IV. The Inflation Issue

To this point our analysis has been mainly concerned with the question of how monetary policy works to increase the level of national income in periods when the major aggregate economic problem is seen to be unemployment. In recent years, however, price increases have been regarded as excessive, and it would thus seem appropriate to spend some time on the inflation issue. In switching to this new model we are, of course, changing our underlying assumptions. Whereas before we assumed that expansionary policy would increase output and leave prices unchanged, we now assume that prices will increase and that there will be no change in real output.

There are two kinds of questions we want to consider. The first relates to the effect of inflation on the bond market and on the indicators of monetary policy. The second aim of this section is to develop a model which will illustrate the effects in an open economy of a monetary expansion which results in price level increases. We will first consider inflation in the context of a closed economy and will then introduce the assumption of an open economy with perfect capital mobility.

One of the most important implications of price level changes is that it becomes very difficult to correctly interpret changes in certain of the traditional monetary indicators. For example, inappropriate conclusions can easily be drawn from observed changes in the interest rate (the rate of return on bonds) and the operations of the central bank in the bond market. To illustrate, suppose that prices are rising. At a given rate of interest this will tend to make bonds less attractive and the public sector will tend to substitute other assets for bonds. They will tend to shift out of bonds and into commodities, stocks, and money. Thus the private sector will attempt to sell bonds, which will reduce their price and increase their rate of return. Suppose that the private sector is successful and induces the central bank to buy these bonds. We would

then observe the central bank buying bonds and bond prices falling, which points out the importance of knowing which side of the market is active and which is passive. Just as in any supply and demand situation, one cannot predict how price will behave when quantity supplied increases unless one knows whether the supply curve has shifted or whether there has been a movement along the supply curve. If the central bank acts passively in the bond market, then associated with open market sales we would expect to observe interest rate reductions, and with open market purchases, increasing interest rates would be expected. This suggests that the interest rate should not be relied on as an indicator of what kind of a policy the central bank is pursuing.

In Figure 2 the horizontal distance  $O_g O_p$  measures the total quantity of bonds held by the public (including the commercial banks) and the government, and the vertical axes measure bond prices.  $D_g$  is the government's demand for bonds with  $O_g$  the origin, while  $D_p$  is the public's demand for bonds with origin  $O_p$ . From the point of view of the government,  $D_p$  is the supply of bonds while from the public's point of view the supply of bonds is  $D_g$ . In equilibrium bond prices are  $P_0$  with the quantity  $O_g B_0$  of bonds held by the government and the quantity  $B_0 O_p$  held by the public. Note that Figure 2 assumes that the government's demand for bonds is completely price inelastic, contrary to the implicit assumption of the preceding paragraph.

Now suppose that due to inflation the public's demand for bonds is reduced to  $D'_p$ . If the central bank does not enter the market then bond prices will be bid down until the public is prepared to hold this same quantity of bonds. The price of bonds will be  $P_1$  and there will have been a corresponding rise in the interest rate. The public's holdings of bonds is still the same, however, and thus, other things being equal, no downward pressure has been applied to the money supply so that no contractionary pressure on national income has been exerted. Bank loans and spending will be the same as before.

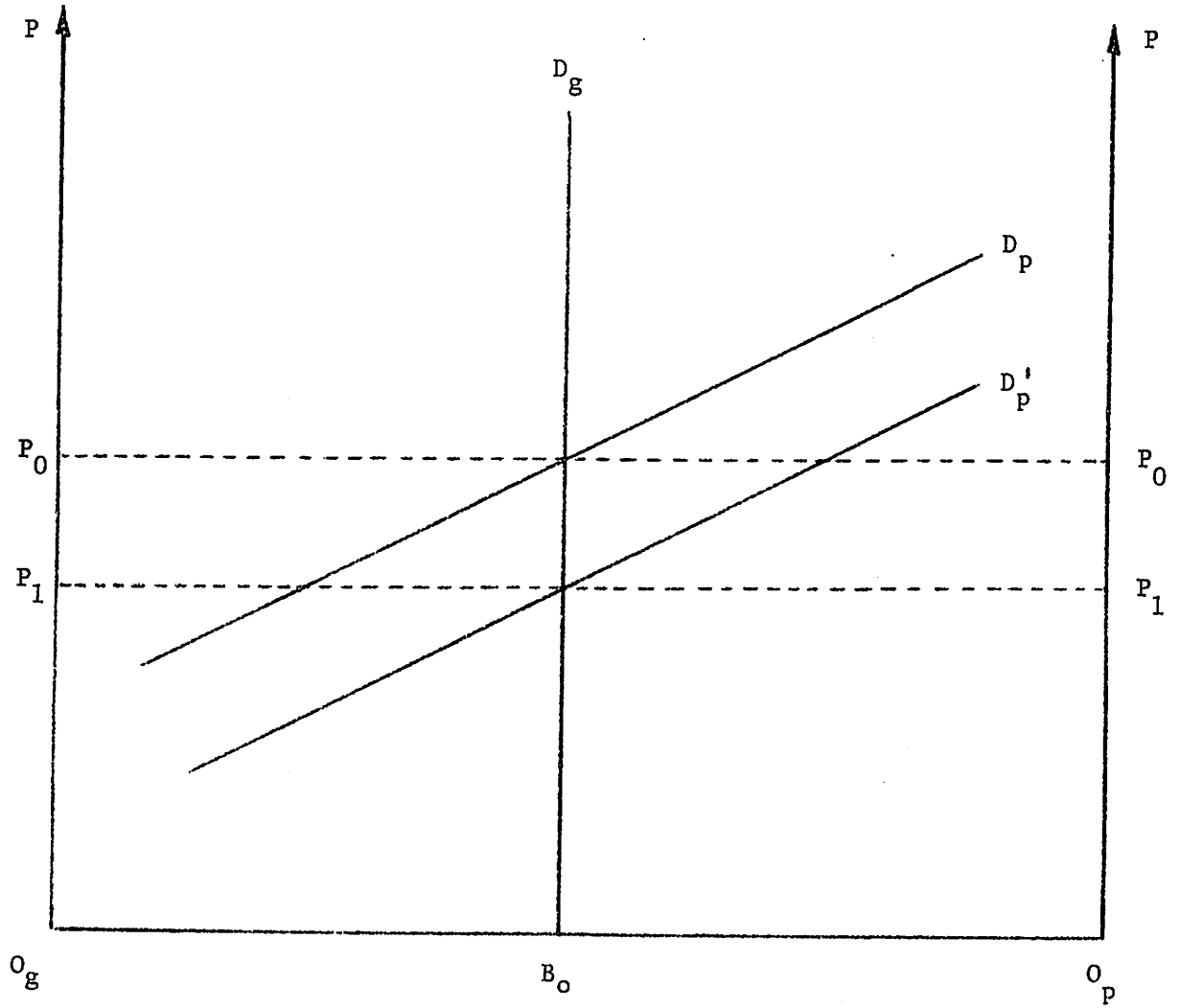


Figure 2

Again we see that the observation that interest rates are rising cannot be taken as an indication that contractionary monetary policy is being pursued.

Now suppose that the monetary authorities attempt to reduce the inflationary pressure by selling bonds. This will result in further upward pressure on the interest rate. But observe that if with the prevailing rate of inflation,  $P_1$  is the bond price which results in an equilibrium between the rate of returns on bonds and the returns on other assets, further upward pressure on the rate of return on bonds would be expected to result in an increase in the demand for bonds which would mitigate the upward pressure on the interest rate. If substitution among assets is perfect, and if the rate of return on other assets is fixed, then the action by the central bank will have no effect on the rate of return on bonds. In such a case the return on bonds is set by the market quite independently of what the central bank chooses to do.

We will now consider briefly the other extreme case where the central bank is dedicated to the task of maintaining the rate of return on bonds at some appropriate level, or of maintaining a more or less fixed differential with foreign rates of return. In this case we could consider the central bank's demand curve to be the horizontal line  $P_0 P_0$ . Again, with inflation the public's demand for bonds will shift to the right, say to  $D'_p$ , but in this case bond prices will be kept constant by purchases of bonds by the central bank. This purchase of bonds will have, of course, exactly the same affect on the money supply and the level of national income as an open market operation, and thus there will be further inflationary pressure generated. Thus inflation feeds on itself in the case where the central bank operates to stabilize bond prices. In such a world monetary pressure is exerted by the market and not by the central bank, and furthermore it will always be perverse.<sup>26</sup>

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<sup>26</sup> Note that in recessionary times just the opposite will be true. If the central bank attempts to maintain the rate of interest, or acts passively by selling bonds when an increase in public demand bids up their prices, further contractionary pressure will be placed on the economy.

We now turn to the question of the affects than an inappropriate monetary policy will have in a situation in which capital is perfectly mobile internationally. This is obviously a complex issue which cannot be dealt with extensively here, so we will content ourselves with a few preliminary observations. First, because we have inflation the real and the money rates of interest will no longer be equal but will differ by the percentage rate of inflation.<sup>27</sup> This conclusions, while obvious, has rather important implications for the question of the effects of monetary policy in an open economy. To illustrate we will consider the diagram as presented by Mundell.<sup>28</sup> In Figure 3 the horizontal axis measures the level of money income,  $Y$ , while the vertical axis is a percentage axis along which we can indicate the money rate of interest, the real rate of interest, and the rate of growth of output. The IS and LM curves are the traditional ones, while the GG curve has been drawn so that the vertical distance between GG and IS gives the rate of growth of output for each level of investment and savings. At any equilibrium level of income the real rate of interest is read from the IS curve and the money rate from the LM curve. In order to have the traditional equilibrium with both rates of interest equal to  $i_0$  and income equal to  $Y_0$ , the rate of monetary expansion must be equal to AB, the rate of increase of income. In such a situation there will be no inflation for the money supply is growing just fast enough to satisfy the increasing demand for money brought about by the increase in output. Observe that this equilibrium is perfectly consistent with our earlier analysis. The points B of Figures 1 and 3 correspond. Recall that  $IS_1$  of Figure 1 will be

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<sup>27</sup>The discussion here draws heavily on Robert A. Mundell, "Real and Money Rates of Interest," Journal of Political Economy 71 (June, 1963) and "A Fallacy in the Interpretation of Macroeconomic Equilibrium," Journal of Political Economy 73 (February, 1965), 61-6. For an extension of this latter article see Thomas J. Courchene, "Money, Growth and Macro Economics: An Extension of the Mundell Analysis," Journal of Political Economy, (forthcoming).

<sup>28</sup>Mundell, ibid.



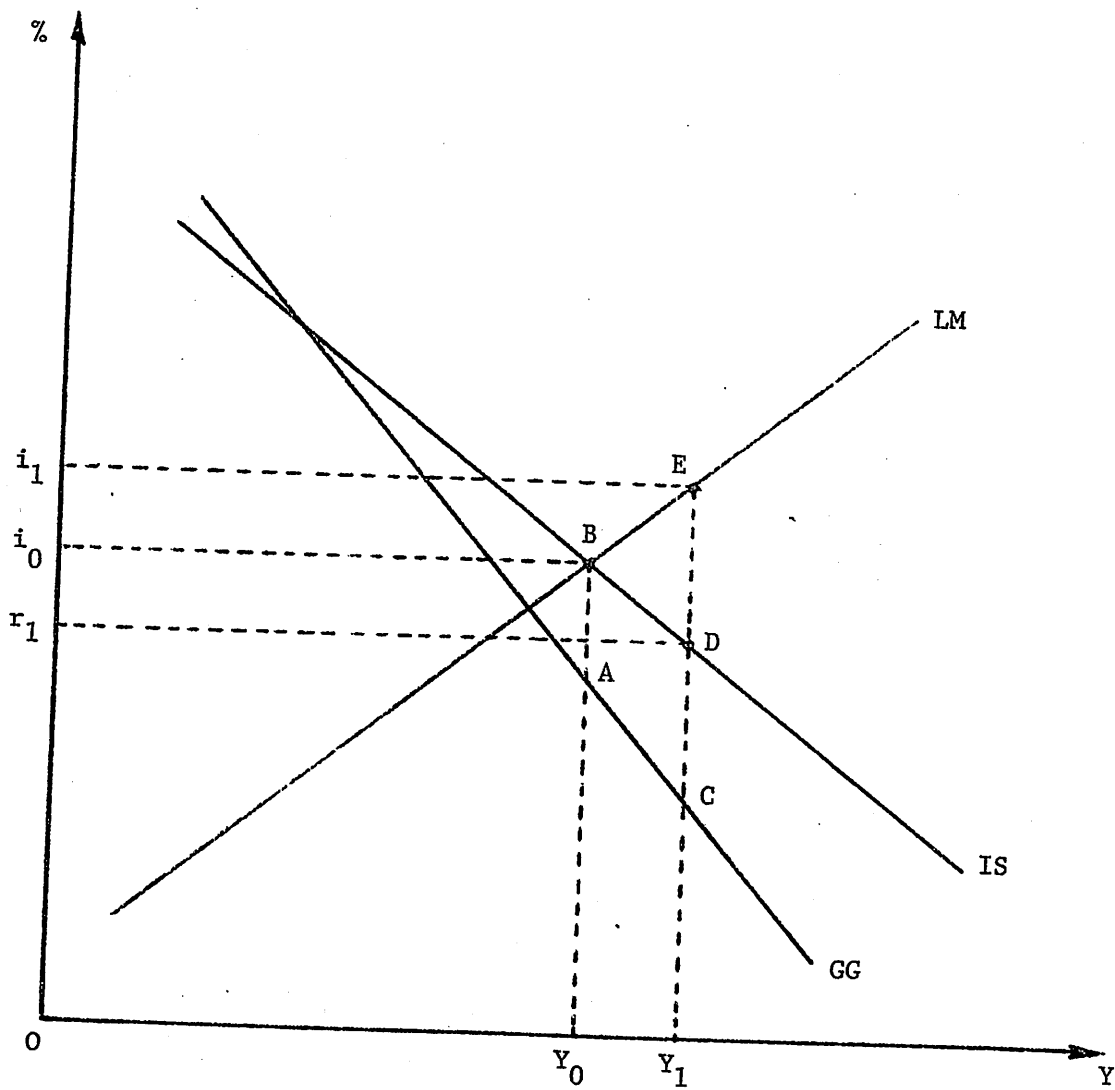


Figure 3

stationary as long as the money supply continues to increase at the same rate.

Now suppose that an expansionary monetary policy is pursued with the result that the money supply is growing more rapidly than output. The rate of growth of the money supply might, for example, be EC with the result that the new equilibrium level of money income would be  $Y_1$ . The real rate of interest is  $r_1$ , the money rate of interest  $i_1$ , and the rate of inflation is the distance DE.<sup>29</sup> In terms of our earlier analysis, this additional increase in the money supply does not result in a shift in the IS curve, because, by assumption, there is full employment, and the spending of new loans bids up prices rather than increasing output.

Turning now to the open economy with perfect capital mobility, it is clear that the model as presented in Figure 3 gives rise to quite different results than those which are usually derived. First of all, the money rate of interest, which is the rate of return on bonds, is seen to rise rather than fall, and thus a monetary expansion will result in a capital inflow rather than a capital outflow. Under flexible exchange rates this will appreciate the exchange rate, reduce exports and increase imports, and shift the IS curve to the left. This change in the current account will be reinforced by the influence of the increasing price level.<sup>30</sup> This process will continue until a new equilibrium is established with the money rate of interest equal to  $i_0$  and the real rate of interest lower by the amount of inflation. The level of money income will again be  $Y_0$ , which represents a lower level of real income because of the inflation.

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<sup>29</sup> Note that the rate of monetary expansion is always equal to the vertical distance between GG and LM. For simplicity we are also assuming that the short- and long-term rates of interest are equal.

<sup>30</sup> The price change and the resulting change in the current account position will also tend to depreciate the exchange rate, which will, in part, offset the influence of the capital inflow.

Thus with flexible exchange rates, a too rapid increase in the money supply could result in both inflation and unemployment.

With fixed exchange rates the results are again quite different than those usually presented. In this case the capital inflow will put upward pressure on the exchange rate, and to prevent such a change the monetary authorities will buy foreign exchange with domestic currency. Again the pressure on the exchange rate will be reinforced by the direct influence of increasing prices on the current account. Of course this increase in the domestic money supply will cause further price increases and more capital inflows, and an inflationary spiral will be generated. To check this inflation the monetary authorities will have to apply contractionary pressure through open market sales of securities. Thus under both flexible and fixed exchange rates, an increase in the money supply which results in inflation will have dramatically different effects than those derived for the case where prices are assumed not to change.<sup>31</sup>

In concluding this section it is perhaps worth reiterating the observation that our discussion here is not meant to be the final answer to the difficult question of how monetary policy will operate in an open economy when prices are allowed to rise. For one thing we have presented only one model of inflation, and other more traditional kinds of approach might well lead to somewhat different conclusions. Nor have we exhausted the implications of the one model that we have considered.

#### V. Summary and Conclusions

The purpose of this paper has been to re-examine the effectiveness of monetary policy for an open economy in which there is perfect capital mobility.

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<sup>31</sup>Although Takayama, *ibid.*, claims to have allowed for price changes, he does not distinguish between real and money rates of interest. Such a distinction seems crucial if price level changes are to be incorporated in a meaningful way.

We have argued that insofar as a money supply increase is accomplished through the making of loans, there will be a direct effect on national income which is independent of the interest rate and which will occur under both fixed and flexible exchange rate systems. We have further suggested that this direct effect will tend to move interest rates in a direction opposite to that suggested by traditional analysis so that the overall effect of a monetary change on the interest rate is not clear. Accepting the fact that interest rate changes (or tendencies to change) will influence the level of income through capital flows, this implies that it will be difficult to determine a priori whether monetary policy will be more effective under fixed or flexible exchange rates. We have also pointed out that if there is perfect substitution between domestic and foreign securities, then open market operations may not be able to change the money supply. Some attention was given to the inflation question, and it was shown that in a full employment situation, or in any situation where increases in aggregate demand tend to increase prices rather than income, the undesirable consequences of an inappropriate monetary policy may be more serious than one would suspect.

In conclusion, we hope to have shown in this paper that the usual analysis of the effect of monetary policy in an open economy is not general and that policy recommendations made in the strength of such analysis could be misleading. It is quite possible, of course, that the traditional conclusions are the correct ones, for whether or not the affects we have described will be important enough to affect the final results will depend on such things as the extent to which a money supply increase is accomplished through the making of loans which are spent on newly produced goods and services, and on the extent to which domestic securities, foreign securities, and domestic savings accounts are substitutes for one another. Unfortunately, the first of these at least seems likely to depend on the prevailing economic conditions, so that definite conclusions may be difficult to reach.