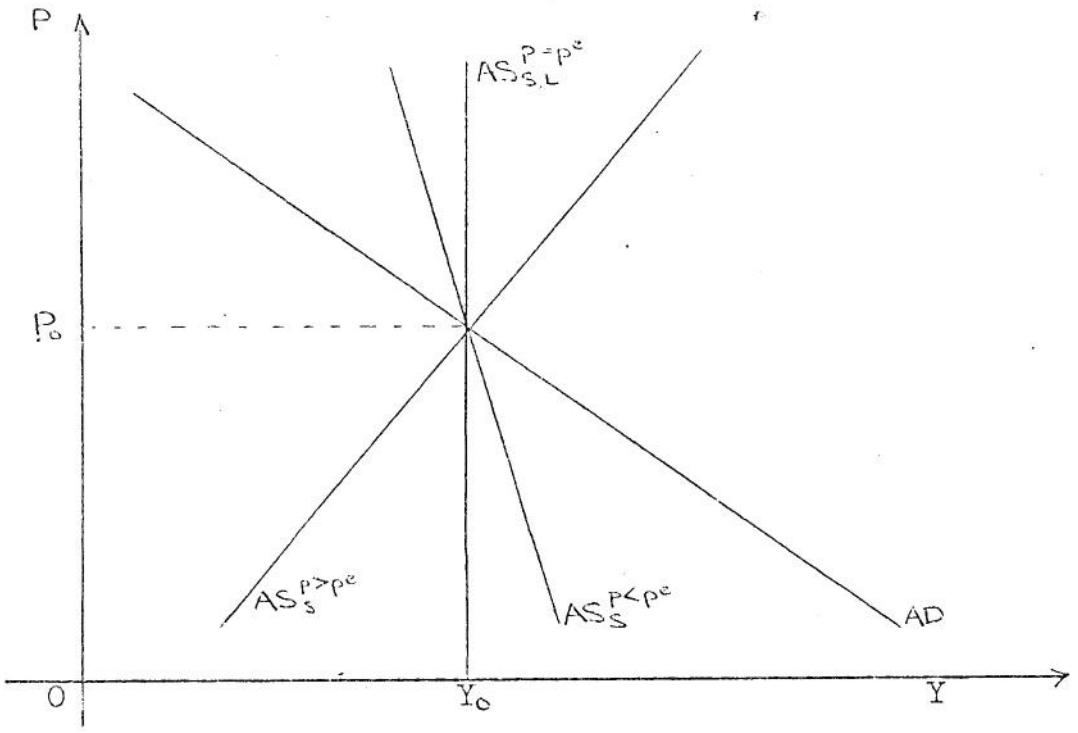
6. Monetary Targets and Economic Policy

Control of Monetary Aggregates

Monetary Control: Supply and Demand

Pages 15 – Annex 7



Aggregate supply may be characterized by noting, from Lucas and Rapping (34), that the augmented Phillips curve is itself an aggregate supply function. Almost all production functions are homogeneous of degree zero in prices since a proportionate change in all input and output prices is equivalent so far as firms are concerned, only to a change in accounting units. Only relative changes in input and output prices will affect the output decision. Thus, if policy is such that prices turn out to be exactly what firms expected, the aggregate supply curve will be vertical with respect to the price level in both the short and long run. However, in the short run, firms may be mistaken in their expectations of price changes. If the actual output prices they can obtain turn out higher than they expected when they set their base production plans, they will find it profitable to increase production. Vice-versa, actual output prices below expected prices will lead to cut-backs in production. Thus, in the short run, the aggregate supply curve will have positive slope if prices are above expectations and negative slope if they are below. In the long run, learning processes are taken to be such that expectations about prices are fulfilled. Hence, as time goes on, the aggregate supply function tilts back to the vertical. Algebraically, the

supply function may be expressed as

$$\log Y_t = h(\Delta p_t - \Delta p_t^e) \qquad h' > 0$$

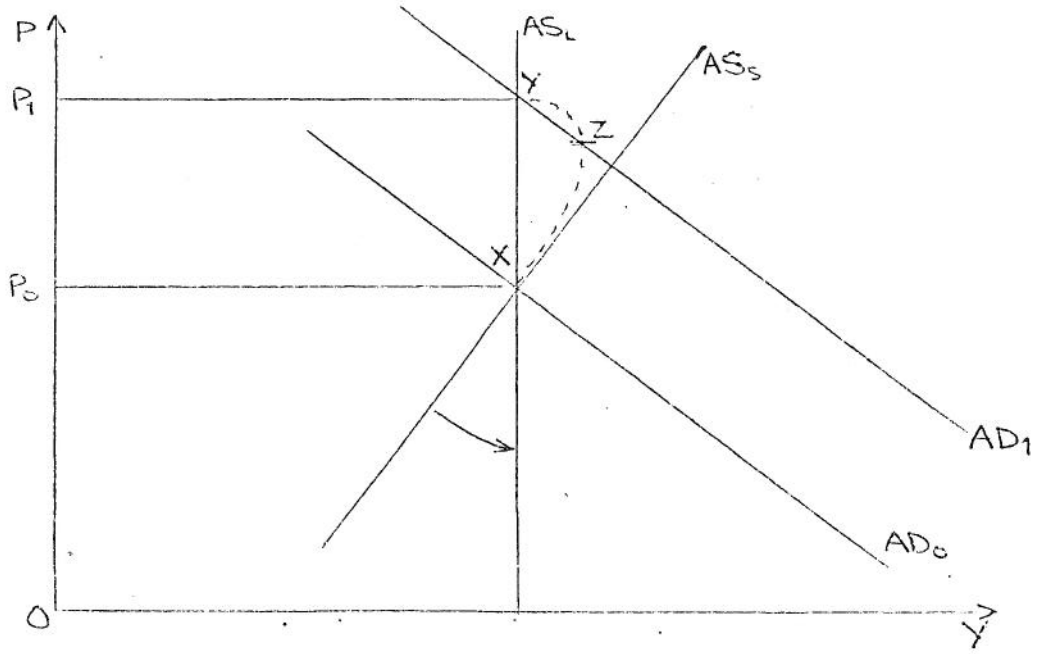
where

Y_t = deviations of output from its planned level

P_t = actual prices

P_t^e = anticipated prices

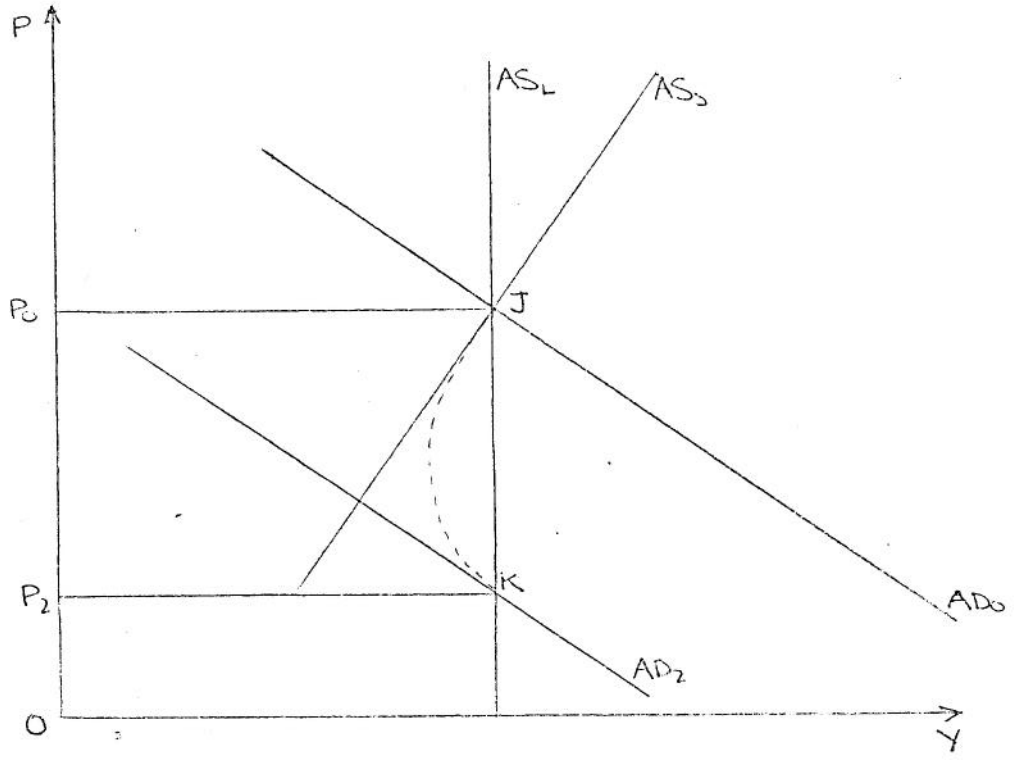
The way in which this model operates is as follows. Suppose either government policy or external factors cause a rise in aggregate demand and create an unexpected rise in prices, with demand rising to AD_1 from AD_0.



This situation might characterize the UK in 1972/3. At first, the economy moves along the short run supply curve AS_S. But, as price expectations are revised and the higher prices are forecast, the supply schedule swings towards AS_L. Hence the economy follows the dotted path XY. Thus, at first, we observe rising output and prices. But after point Z, output stops and then falls while pric go on rising. This could be the case of Britain in 1974/5. The long run result of this change in aggregate demand is no change in

output but a permanent increase in prices from Po to P_1.

A deflation (Britain 1976/7) works in the opposite direction, with aggregate demand reduced from AD_0 to AD_2.



In this case, the economy follows path JK. Eventually output is unaffected by the deflation and prices are permanently lowered to P_2. But in the short run, before expectations adjust, output will be reduced and unemployment will rise. The extent to which output falls is governed by the speed at which price expectations adjust; the more rapid the learning process, the less painful is the adjustment. There is a parallel here with Hicks' concept of real wage resistance.

Before turning in the next section, to the empirical evidence for this model, we ought to note one other important way in which monetary policy may enter. We have assumed so far that the basic production function is homogeneous of degree zero in prices. Chicago monetarists, however, have always asserted that a prime characteristic of money is as a factor of production. (See, for example, Friedman's presidential address to the American Economic Association (18)). If, indeed, money does enter the production

function, then a rise in prices will reduce real balances and reduce production. Thus, even in the long run, the aggregate supply function may not be independent of the price level and will be negatively sloped.* Results derived above would require some modification if this is in fact the case.

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*It is possible in this case that the system could be unstable. If aggregate supply has a slope absolutely less than that of aggregate demand, then prices could explode or fall monotonically to zero. If supply falls short of demand, the price level will rise. In the circumstances described, supply would be reduced more than demand by the price rise requiring further price rises without limit. Since this scenario does not seem to describe the real world, we may safely dismiss the point as of academic interest only.

C. The Transmission Mechanism: Empirical Evidence

If the above model is correct, then the first issue we should consider is whether nominal aggregate demand is at all correlated with any of the controllable monetary parameters. Such a correlation would not be sufficient for a model such as the above to hold but it is a necessary condition. For the United States, there is ample evidence that such a correlation exists. Apart from the St Louis' equation [2], Laffer and Ransom [31] found evidence of a strong correlation and even the critics of this approach (for example, Modigliani [36]) only disputed the interpretation of the correlation, not its existence. The issue is also clear-cut in the UK. Matthews and Ormerod [35] found a good correlation between nominal income and lagged monetary aggregates. They also found that it did not matter very much which monetary aggregates were used. What might, however, have been the most interesting question - whether the monetary base correlates with nominal income - was not answered in this study because of an inappropriate specification of the monetary base.

To consider the empirical evidence further, we need to break aggregate demand down into its components. Persons broadly contribute two forms of demand: (i) consumption; (ii) investment in housing. For consumption, there is reasonably firm evidence that broadly defined financial wealth has a strong positive effect. Implicit effects of this kind are present in the equations estimated by Davidson et al [10] and by Stone [42]. Explicit evidence of financial wealth effects were found by Hilton and Crossfield [25] and by Grice [21]. From this, the next question to ask would seem to be whether liquidity has any further impact other than that liquid assets count as wealth. Forsythe [15] and Townend [48] both found apparently significant relationships between consumption and liquid assets but Grice found that their effect disappeared when total financial wealth was included in the equation as well. Over the estimation period of most of these equations (usually 1963-1975), liquid assets (M5 and hence M3 and M1) do not seem to have had any impact on consumption other than that they count as wealth.

This conclusion should not cause surprise. Over most of the estimation period considered, the exchange rate was fixed and the authorities tended to hold an interest rate target rather than a money supply target. Under these circumstances, the supply of money is not controlled. Hence, within the constraints imposed by their total wealth, persons could hold as many liquid assets as they wished. Thus liquidity itself, prior to 1973, cannot have been a primary determinant of consumption. With the coming of unofficial and then official monetary targets, this argument no longer holds; if the money supply differs from the demand for money there may be effects on expenditure. Unfortunately, I know of no empirical study for the UK which has tried to test this hypothesis. On the other hand, Purvis [44] has isolated such effects in Australian data and it seems reasonable to suppose that they operate here, too.

Two other monetary factors might impinge on consumption as well as the money supply. First, interest rates can affect consumption as a real rate by changing the substitution terms of present for future consumption. Bean [6] could find no firm evidence for such an effect in the UK data, though a small effect was consistent with the evidence. Again, nominal interest rates are inversely related to the value of fixed interest debt; to the extent that persons hold such debt (mainly gilts) a rise in nominal interest rates will reduce expenditure via the wealth effects already discussed. Persons' total holding of gilts are large so that this effect could be powerful but many of these holdings are indirect through the medium of life assurance and pension funds, which may make for attenuation.*

The second factor is credit. Persons' current command over resources is determined not only by their wealth but by their ability to borrow. As with money, credit can only have an effect when demand differs from supply. Unlike money, however, there is no question that supply can exceed demand since no one is compelled

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* I believe that Minford has a model in which this effect is important. I am not familiar with this work personally but I think Mr Bell has knowledge of it.

to take up advances he does not want. It is therefore only excess demand that we are concerned with. There are very few models for the UK which allow the testing of credit effects correctly, in this way, because bank advances are usually not forecast in a way which will allow the excess demand to be identified. Certainly, the LBS and NIESR models are misspecified in this respect. Mr Spencer's bank advance equations do, however, allow the measurement of the excess demand and the effect of this may be tested empirically against consumption. Bean [6] attempted precisely this but found no significant correlation. This negative result may, though, be due to the difficulties of measuring this excess demand and the final result is still in doubt. It does seem clear though, that the effect of bank credit on consumption must be weak, if present at all. By contrast, the effect of consumer credit on consumption is well documented for the UK (see Ball and Drake [4] or Allard [1]). A change in controls has a very rapid effect on purchases of consumer durables perhaps measuring up to ⅔% of GDP. This effect wears away over time. In spite of Dow's plausible theoretical reasons for why the effects might spread to non-durable purchases [12], no empirical evidence of such effects has been obtained.

Investment in housing by persons is a much smaller component of demand, barely a fortieth of consumers' expenditure. Qualitatively, the determinants of housing investment should be the same as of any personal expenditure. Two features, however, make this expenditure special; namely, that for most individuals a house is the largest purchase they are every likely to make, necessitating special financial arrangements and that important special financing agencies deal exclusively with this financing. As a result, the excess demand for housing (Building Society) credit is almost certain to dominate other determinants, including wealth and interest rates. Unfortunately, the very fact that housing finance has been chronically supply-constrained makes it difficult to determine the demand curve and hence to measure excess demand. In time, the effects of the other determinants are obscured. Thus, although many people (including myself) are prepared to assert that credit is a most important factor in this market, no models

are available which give satisfactory quantitative linkage between housing expenditure and credit.

Turning to the corporate contribution to aggregate demand, only two of the three monetary factors we considered for persons can be relevant. Firms are merely collections of individuals associated in a particular legal framework. By definition, firms' balance sheets balance - assets exactly equal liabilities - and hence they are not ultimate holders of wealth. Since their wealth is always zero, wealth effects cannot operate on corporate expenditures. On the other hand, both credit and interest rates may be relevant. Traditionally, it has been the real rate of interest which has been felt to be relevant to investment, Keynes himself taking this view. Modern analysis has tended to follow Jorgenson's model [26] and its extensions where the real rate enters as the major determinant of the cost of capital. These models have proved quite successful in the United States but less so in the UK. (Boatwright and Eaton [7] published an apparently well-fitting equation for manufacturing investment based on an Eisner/Nadiri model but Treasury work was never able to replicate these results.) Flemming [14], however, has suggested that nominal interest rates may be an important determinant of investment because of the "front-loading" problems associated with high nominal interest rates and conventional industrial financial borrowing instruments. The evidence, particularly over the last few years, is consistent with a substantial effect of this kind. With regard to stockbuilding, it has not been easy to find either real or nominal interest rate effects. Trivedi, [49], reported weak effects from real rates for the UK up to 1970 but the latest empirical work, over a longer time period, has failed to detect even weak effects even after considerable searching of the data. Other determinants, particularly expected sales, appear to swamp any interest rate effects which might be present.

As with personal expenditure, credit can only affect corporate expenditure to the extent that there is excess demand. The financial institutions themselves have frequently asserted that there are no important lending constraints to viable industrial

concerns. If this is so, then credit cannot be a primary determinant of expenditure by firms. Mr Spencer's failure to find any period when industrial and commercial firms were not on their demand schedule adds credence to this assertion. Indeed, this is not entirely a surprising conclusion; apart from the fact that official policy has usually been to give preference to industrial borrowers, it is normally in financial institutions' own interests to restrict credit first to personal customers rather than corporate ones, since the transaction costs and default risks are typically higher in the former case. These considerations, then, suggest that credit has not been an important factor in determining either investment or stockbuilding.

So far, we have only considered aggregate demand. Evidence bearing on aggregate supply is sparse because, until recently, few economists have concerned themselves with aggregate supply at all. The analysis of the preceding section suggested two main impact points of monetary variables here: (i) the possibility that money balances are themselves a factor of production; (ii) the impact of monetary policy on output price expectations. Friedman's original illustration of his point that real balances are a factor of production was to imagine how much less efficiently transactions - the mainspring of a market economy - could be carried out, if no money existed at all. While we might readily agree that production would fall in these circumstances, this is scarcely to the point if we are interested in the effects of a <u>feasible</u> change in real balances. To date, the only empirical study that I am aware of is by Sinai and Stokes [46] who reported that real money balances, on the US M1 definition, were an important factor in the production function for the United States. This result was criticized by a number of economists in a subsequent Review of Economics and Statistics symposium [46] but, on my reading of the debate at least, their main conclusions survived. Rudimentary evidence for the UK, however, comes from the construction industry. The private housebuilding industry has an unusually high proportion of small firms with limited financial resources. It seems fairly clear that credit restrictions have affected the supply of private housing starts by reducing the transactions balances of some of these small

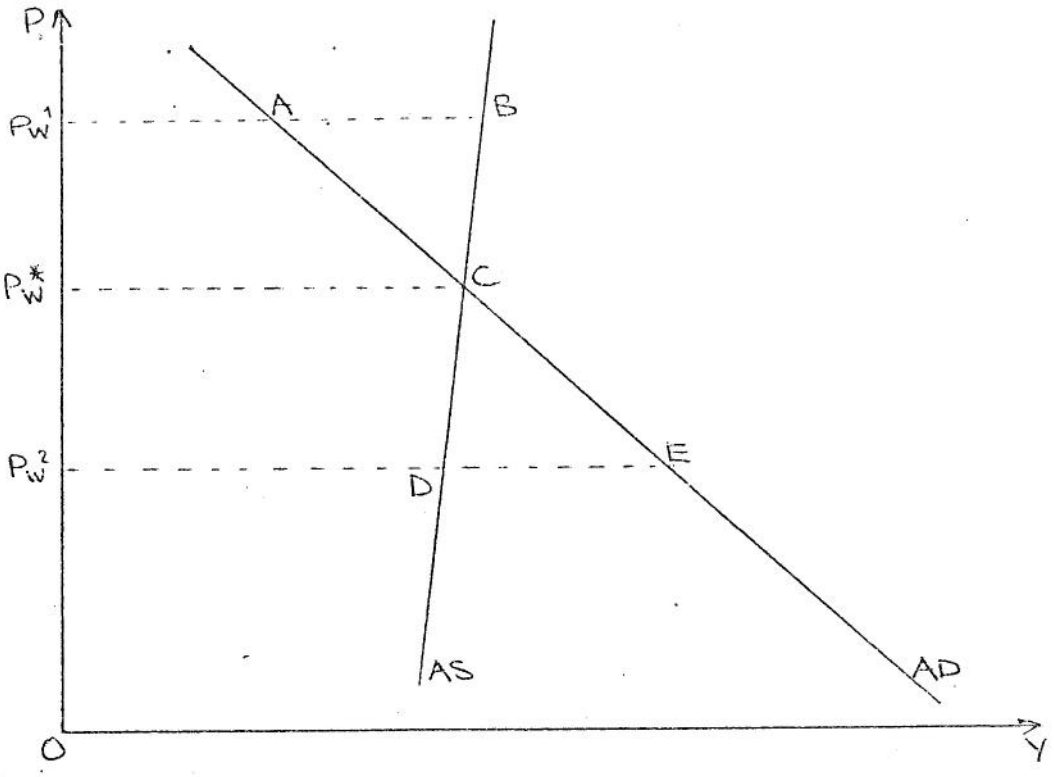
firms below the level which they require to remain in business. (See Whitehead [51].) If this experience has also occurred in other parts of the economy, then real money balances could be important factors of production in the UK, as well as in the United States. Changes in production induced by credit policy could be important at the margin and the inference for policy would seem to be that the direction of credit policy is at least as important as the strength with which it is applied.

Finally, in this section, we have to consider the formation of producers' output price expectations. In the analysis of the previous section, this process is crucial, since the divergence between actual and expected prices determines both the future output and price path for the economy. We can deal with the empirical evidence on this topic very quickly, however: (a) to my knowledge there are no satisfactory studies for the UK: (b) the analysis, in any case, requires some modification with regard to the price level when we consider an open small economy like the United Kingdom rather than a closed one. It is therefore now convenient to extend the analysis to allow for this fact.

D. The Transmission Mechanism: External Considerations

In the analysis so far, the aggregate price level adjusts to an equilibrium where aggregate demand and supply equate. In a small open economy, this is no longer the case. Rather the price is given by the level of international prices which in turn are only negligibly influenced by demand and supply consideration of the small economy itself. This "law of one price" is an assertion about the way the world functions and, as such, requires empirical justification. We may then find instead that either the world does not behave like this at all or that the "law" applies only after such a long period that it is virtually irrelevant for all practical considerations. On the other hand, Ball and Burns [5] found evidence that the law of one price did approximate to reality for the UK virtually immediately and there therefore seems justification for taking it as a working assumption.

Diagrammatically, the situation is as here:-



(Note that the "run" for aggregate supply is not specified in this diagram.) If world prices are initially at P_w^1 then aggregate supply will exceed aggregate demand and there will be a current account surplus of AB. If, rather, world prices were at P_w^2, then demand would exceed supply and the current account deficit would be DE. In either case, if there were no banking system, the monetary flows associated with these surpluses and deficits would would tend to shift AD and AS in such a way as to intersect at the prevailing price level. An alternative mechanism would be for the exchange rate to adjust so that world prices in domestic terms were moved to the supply/demand intersection at P_w^*. Before proceeding, note that the character of the aggregate supply and demand curves has not changed from the previous model so that all of the empirical evidence reviewed on their determination still holds. The only substantial change is that the collection of these factors now determines the current account, not the price level.

Two factors mar the simplicity of this analysis: first, the capital account and second, the existence of a sophisticated

financial system, capable of manufacturing financial assets and liabilities independently of any physical transactions in the economy. Partly because of these considerations, the analysis is different in a fixed or in a floating exchange rate regime. We take these two situations as extreme paradigms and consider the situation in each case. It is important to note, however, that the exchange rate regime which has prevailed in the seventies has not been exactly of either extreme. Actual experience has rather contained elements of both regimes.

1. Fixed Exchange Rates

The main point to note about this regime is that the private sector of the economy, having access to the Exchange Equalisation Account, not only controls real money balances but can also control its holdings of nominal money. Hence, so far as the government is concerned, monetary policy is not possible but it may still have a credit policy. (This is the counterpart of the argument, in Section C above, that monetary aggregates, rather than credit, could not have affected consumption upto 1973).

In this regime, therefore, it is domestic credit expansion, not monetary growth, which becomes important since it is only the former aggregate which the authorities can control.

The current account of the balance of payments may be regarded as the excess of the domestic supply of goods and services over the domestic demand for goods and services. Effects of credit policy therefore depend exclusively on how they affect demand relative to supply. Suppose we start in a situation of balance and the government expands credit. Several effects may begin to operate, the relative strengths of which largely depend on evidence we have already considered in Section C:

a. If money balances are themselves a factor of production, the increased credit may temporarily increase aggregate supply. Since, however, money balances are controlled by the private sector in this regime, there is no reason to suppose that initial money balances were not optimal. After the initial disturbance, money balances are therefore likely to return to their original level and any effect on output will be transient;

b. The increased credit will allow the private sector to purchase more goods and services. Since demand will rise on this count relative to supply, the balance of trade will worsen;

c. If the law of one price does not hold instantaneously, and the evidence is clearly that it does not, increased demand may cause competitive bidding for domestically produced goods causing, in turn, a rise in the price level. This will reduce the real value of the private sector's holdings of assets denominated in money terms, primarily money itself. A replacement demand will therefore be created and some of the newly created credit will be required to meet this demand. Obviously credit used in this way is not available for purchase of goods and services and thus the price rise itself improves the balance of trade.

Turning to the capital account, this may be characterized as the excess of domestic demand for financial assets over domestic creation of these assets. In the short run, income and wealth may be regarded as constant and the real demand for financial assets depends then primarily on interest rates. The new supply of financial assets is represented by that part of the new credit creation directed towards the private sector. In the first instance, there are therefore two factors which influence the capital account:

a. by increasing the supply of financial assets relative to demand, the credit creation worsens the capital account;

b. To the extent that prices are bid up by the new credit, a replacement demand for financial assets is generated. Of itself, this factor must improve the capital account.

In total, the balance of payments is the sum of the capital and current accounts and likewise, the effects of credit creation are the total of the separate factors identified for each account. An important point to note is that so far the analysis is short run in nature. (Indeed, strictly, it should be in instantaneous impact terms. A more precise mathematical derivation of these results is given in the Appendix). When we turn to the long run, the analysis is much simplified, by two factors. First, any transient

effects of the credit creation on output must vanish since producers are free to return their real money balances back to the initial position. Secondly, the law of one price must operate in the long run since competing goods cannot trade indefinitely at different prices. Hence the domestic price level is given for the economy independently of credit creation and there can be no long run possibility of credit creating its own replacement demand. Together these two factors imply that only one of the influences identified as affecting the balance of payments operates in the long run, namely the increase in the supply of financial assets. This is intuitively plausible. With a fixed price level and after portfolios have fully adjusted, there is no reason to suppose that the increase in the supply of financial assets will change the demand for such assets. If supply is increased therefore, then this excess supply cannot be eliminated by changes in the price level: rather the excess supply will flow away across the foreign exchanges and domestic demand and supply restored to equilibrium in this way. Overall, therefore, the long run outflow on the balance of payments as a whole must exactly equal the credit expansion.

2. Floating Exchange Rates

In this second paradigm, we assume that the float is "clean" and characterized by zero reserve flows. Since the authorities now themselves control reserve movements (at the expense of freeing the exchange rate) and since they may also control domestic credit expansion, they have the option to control monetary expansion in total. Indeed, if reserve flows are fixed at zero, domestic credit expansion and monetary expansion become identical.

Short run analysis proceeds much as before and we may summarize the main effects of a credit/monetary expansion as follows:

a. Increased money balances, acting as factors of production, increase the aggregate supply of goods and services and therefore improve the balance of trade;

b. Credit displacement effects within the private sector worsen the capital account;

c. Increased money balances lead to greater purchases of goods and services by the private sector causing worsening of the balance of trade;

d. To the extent that the price level is bid up, a replacement demand for money is generated improving both accounts of the balance of payments.

Two modifications are required to this analysis, however. First, because the exchange rate is now free to fluctuate, even with constant international interest rates, domestic interest rates must change to maintain interest rate parity. An appreciating exchange rate leads to lower domestic nominal interest rates and thus increases the domestic demand for money. This effect will tend to improve the balance of payments since the demand for money relative to its supply has risen and in turn creates further upward pressure on the exchange rate. Mutatis mutandis, depreciating exchange rates can be seen to generate of themselves further pressure for depreciation. Hence in both directions exchange rate movements carry a multiplier effect.

The more important modification concerns the way in which excess flow supply of financial assets following from a monetary expansion is eliminated. Since the authorities now maintain reserve flows at zero, any putative excess cannot be eliminated by a balance of payments outflow. Instead, the exchange rate tends to fall in this situation or to rise when there is excess flow demand for financial assets. Thus in this regime, monetary policy becomes almost a perfect substitute for reserve intervention policy in that it has a short run impact on the exchange rate. Tightening monetary policy puts upward pressure on the exchange rate while expansionary policies create downwards pressure on the rate.

Long run analysis in this regime is more complicated than in the fixed exchange rate case. Because the exchange rate is free to move, both the domestic price level and nominal interest rates may vary themselves in the long term. Many more factors operate to generate excess flow supplies for financial assets than in the fixed rate case. But the final adjustment pattern is, however, clear. Excess flow supply or demand is eliminated essentially by movements in the domestic price level, since the demand is taken to be in real terms. The exchange rate must move towards a position where the domestic price level is such as to provide exactly the equation of supply and demand. When such an equilibriating position

has been reached, there is no further appreciation or depreciation so that to maintain interest rate parity the domestic nominal interest rate must equal the international nominal interest rate. Since this is assumed constant, the domestic interest rate also becomes constant so that it too no longer exerts any pressure to move away from the equilibrium.

E Summary and Conclusions

The preceding four sections have all considered different aspects of the same problem, namely how monetary policy interacts with the real economy. In the first section, we asked how monetary policy could be characterized and decided that it could only be described by consideration of a range of indicators of credit, money and interest rates. On further consideration of specific indicators, nearly all had some statistical or technical peculiarities which would have to be taken into account. Amongst the monetary aggregates; M1 is least affected by distortions while M3 is distorted in several ways. Looking at M5 removes some of these but the most important, round-tripping, remains. This distortion is shared by bank lending.

In the second section, a model for the closed economy was derived using elements of both keynesian and monetarist analysis. Its basic framework has aggregate output and the price level determined by aggregate supply and demand schedules. Within this framework, monetary policy was seen to affect the real economy at a number of points. Aggregate demand could be influenced in principle by credit, interest rates and by monetary aggregates: aggregate supply was mainly affected by the extent to which real money balances were a factor of production and in the manner in which expectations were formed. With regard to monetary indicators, the main conclusion of this section is that for an aggregate to be important it must have two properties:

a. Its supply must be capable of control by the authorities;

b. Its demand function must be well determined. Other things being equal, the more stable the demand function, the better the indicator.

Consideration of the empirical evidence in the next section showed

that interest rates had probably had little substitution effect on aggregate demand but may have had impact to the extent that they cause change in nominal wealth. Credit had influence only to the extent that it was in short supply, mainly bearing on personal sector expenditure particularly on durable goods and housing. Monetary, as opposed to credit policy, can have had little effect until recently because the money supply was outside the authorities' control. With regard to aggregate supply, the evidence is thin on the ground but there is a strong suggestion that transactions balances are a factor of production. The process by which producers form their output price expectations is a big gap in our knowledge.

When the analysis is extended to the open economy, domestic credit expansion becomes central. In the fixed exchange rate case, credit expansion has strong immediate impact on reserve flows. These occur through four main channels: credit displacement, effect on the supply of output, income/expenditure effects on goods and services, and effects on real money balances. In the short run all of these effects may operate immediately but in the long run only the credit displacement effect is non-zero. In the long run, the balance of payments outflow equals the initial credit expansion. Monetary policy rather than credit policy is not open to the authorities in the fixed exchange rate case but it is restored as an option when rates are floated. The same four channels of influence operate as in the fixed rate analysis but these will not necessarily become inoperative in the long term. Any disequilibria caused by a monetary or credit expansion are now resolved by movements in the exchange rate. Monetary policy has effects, indeed, much like reserve intervention policy. It should be noted that in both cases, the proportion of new credit advanced to the public and private sectors respectively is an important determinant of behaviour, at least in the short term.

Following on from these conclusions, the policy implications would seem to be as follows:

a. In a floating regime, it is important to control a monetary aggregate. Although its demand may be stable, M1 is not a good candidate for attention since there is no obvious way

in which its supply can be controlled. The monetary base, M3 or M5 are all possible candidates, if their demand can be shown to be stable. Work so far has failed to establish a well determined demand for the base or M3. Theoretical considerations might suggest M5 would have a more stable demand but, oddly, it has received little empirical attention;

b. In a fixed rate system, credit must be controlled, since this is effectively the only possible monetary policy. Credit remains important in the floating rate case;

c. The destination of both credit and monetary policy is important. Care must be taken to ensure that policy designed to affect aggregate demand does not affect aggregate supply or vice-versa. This suggests that directional controls between various sectors of the economy, particularly between the production and consumption sectors of the economy, have an important role to play. Even within aggregate demand, the effect of monetary factors will vary depending on whether the demand originates from the corporate or personal sectors;

d. Finally, balance of payments effects of monetary policy depend to some extent on how credit and monetary expansions originate. The proportion of new credit advanced to the government is an important variable, at least in the short run. Fiscal policy would remain important, therefore, even if we had perfect control over its monetary consequences.

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APPENDIX

Monetary Policy and the Balance of Payments: An Impact Analysis

1. Fixed Exchange Rates. The first point to note about this regime is that the private sector of the economy, having access to the Exchange Equalisation Account, not only controls real money balances but can also control its holdings of nominal money. Hence, so far as the government is concerned, monetary policy is not possible but it still may have credit policy. (This is the counterpart to our argument in section C above that monetary aggregates, rather than credit, could not have affected consumption up to 1973.) Domestic credit C, therefore becomes central to the analysis; it may be divided into that proportion going to the government, Cg, and that part going to the private sector, Cp:-

$$C = Cg + Cp \qquad (i)$$

Consider now the effect of changes in the price level, $\pi = \dot{P}/P$. To simplify, we suppose that the ultrarationality postulate holds so that government debt is not regarded as a private sector asset a and money itself is the only money-fixed asset. Assuming that the private section portfolio were initially in balance, the only effect of the inflation will be to generate a replacement demand for real money balances equal to the proportionate inflation rate time the original level of real money balances outstanding. Given the definition of the current account, the real deficit, D/P, may be expressed as

$$\frac{D}{P} = Y^e - \pi m - y \qquad (ii)$$

where

y^e = private sector real expenditures on goods and services

y = real output

Private expenditure is a function of private sector income (including the real volume of credit created by the government), q, and real interest rates, r.

$$y^e = f(q,r) \qquad \text{(iii)}$$

$$\therefore \quad \frac{D}{P} = f(q,r) - \pi m - y \qquad \text{(iv)}$$

Thus, the current deficit is equal to private sector expenditure less that spent on acquiring new money balances less domestic output. (For simplicity, we take output to be independent of real money balances.) Suppose now that government policy changes so that it requires more credit. Then

$$\frac{\Delta D}{P} = f_q\left(\frac{\Delta Cg}{P}\right) + f_r \Delta r - m\Delta\pi \qquad \text{(v)}$$

At this point, we need to determine the rate of inflation π. We use the model of Cagan [9] and Mundell [37].

$$\pi = a\lambda + (1-a)\pi^* + \ldots \qquad \text{(vi)}$$

where

$\lambda = \dot{M}/M$ is the (endogenous) rate of money creation

π^* = inflationary expectations

Instantaneously, π^* may be taken as fixed. Thus

$$\Delta\pi = a\Delta\lambda \qquad \text{(vii)}$$

At the same time, by virtue of the DCE definition (and ignoring non-deposit liabilities)

$$M = E R + C \qquad \text{(viii)}$$

where

E = the exchange rate

R = the level of reserves in international currency

C = domestic credit outstanding

$$\therefore \quad \lambda_m = \frac{(C)}{(P)}\lambda_c + \frac{(E)}{(P)}\dot{R} \qquad \text{(ix)}$$

where

λ_c = $\dot{C}/C$ is the proportionate rate of credit expansion

Substituting (ix), into (vii) and then into (v), we obtain the expression for the current account of the balance of payments as

$$\frac{\Delta D}{P} = f_q\frac{\Delta C_q}{P} + f_r\,\Delta r - a\left[\frac{\Delta \dot{C}}{P} + \frac{E}{P}\Delta\dot{R}\right] \qquad \text{(x)}$$

We now need to look at the capital account. Just as the current account may be considered as the excess of domestic demand for goods over domestic supply, so the capital account, K, is characterized as the excess of domestic demand for financial assets (K^D) over domestic creation of these assets (K^S).

$$K = K^D - K^S \qquad \text{(xi)}$$

or, in difference terms

$$\Delta K = \dot{K}^D - \dot{K}^S \qquad \text{(xia)}$$

Now instantaneously we can take income as fixed. Given the income-expenditure relationship for the private sector, (iii), instantaneous change in the real demand for financial assets is a function of the real interest rate r. (Note that Π^* is fixed so that the nominal perceived interest rate is just r plus a constant.) Thus from (iii)

$$\frac{\dot{K}^D}{P} = f_r\,\Delta r \qquad \text{(xii)}$$

On the supply side, by definition

$$\dot{K}^s = \dot{C}p \qquad \text{(xiii)}$$

Substituting (xii) and (xiii) into (xia), we obtain the capital account expression

$$\Delta K = Pf_r \Delta r - \Delta\dot{C}p \qquad \text{(xiv)}$$

Finally, we can obtain the balance of payments as a whole as

$$ER \equiv K - D \qquad \text{(xv)}$$

Substituting the current account expression (x) and the capital account expression (xiv) into (xv) and manipulating:

$$E(\Delta\dot{R}) = -(\Delta\dot{C})\left[\frac{(1-\gamma) + \gamma fq - a}{1-a}\right] \qquad \text{(xiv)}$$

where

$$\gamma = \Delta\dot{C}g/\Delta\dot{C}$$

γ is interpreted as the proportion of new credit extended which is advanced to the government.

It is possible to break down the balance of payments expression (xvi) into three identifiable factors:

(i) $(1-\gamma)(\Delta\dot{C})$ represents the worsening of the capital account due to new credit displacing existing credit advanced to the non-bank private sector;

(ii) $\gamma fq\ (\Delta\dot{C})$ represents the deterioration of the current account due to the increased expenditure occasioned by the new credit;

(iii)$(a\,\Delta\dot{C})$ represents the improvement on both current and capital accounts caused by the fact that the new credit has pushed up the instantaneous rate of inflation. In turn, this leads to a reduction in real money balances causing a reduction in domestic expenditure on goods and services and an increased replacement demand for financial assets.

This analysis has two important implications for policy. First, the balance of payments effects of credit policy in a fixed rate regime are substantial and immediate. While the income/expenditure effect may take time to emerge in full, the displacement effect on the capital account is likely to be immediate. Secondly, and perhaps more interestingly, the effect depends upon who receives the new credit. There are two limiting cases:

(a) suppose the government receives all of the new credit so that $\gamma = 1$. From (xiv), the effect on the balance of payments of the new credit is given by

$$E(\Delta\dot{R}) = -\Delta\dot{C}g\left(\frac{f_q - a}{1-a}\right)$$

(b) suppose, instead, that all of the new credit is extended to the private sector. Here, $\gamma = 0$ and the balance of payments effect is given as

$$E(\Delta\dot{R}) = -\Delta\dot{C}p$$

In general f_q will not be equal to unity - it is the impact marginal propensity to spend out of income - and the two expressions will be different.

2. Floating Exchange Rates. In the case of a "clean" float, monetary policy is restored as an option to the authorities. Indeed, overall, credit policy and monetary policy now became identical since no balance of payments flows can drive a wedge between them. The main change required to the fixed rate model is to take cognizance of the fact that the nominal interest rate, i, is now linked to the international nominal interest rate, i*. Assuming that the interest rate parity thereon holds

$$i = i^* + (\dot{E}/E) \qquad \text{(xvii)}$$

Since the interest rate i is affected by the exchange rate, it is no longer sufficient to assume that the demand for real money balances is in stock equilibrium since the interest rate itself

determines, in part, the desired stock. Thus private sector expenditure on new money balances is now given by

$$\Delta(\dot{M})^{D}/P = M\Delta\pi - \alpha\beta\Delta i \qquad \alpha,\beta \geq 0 \qquad \text{(xviii)}$$

where

α = the stock adjustment coefficient of money to interest rate changes

β = the semi-elasticity of real money balances with respect to the rate of interest (ie d log $(M^{D}/P)/di$)

Noting that $\dot{R}$ must be equal to zero in the floating case and taking account of (xviii), the current deficit is now given by

$$\frac{\Delta D}{P} = (f_c\gamma - a)\left(\frac{\Delta\dot{C}}{P}\right) + f_r\Delta r + \alpha\beta\frac{\dot{E}}{E} \qquad \text{(xix)}$$

(Contrast with expression (x) in the fixed rate case.)

On the other hand, the capital account expression remains unchanged and is given by expression (xiv).

$$\Delta K = Pf_r\Delta r - \Delta\dot{C}_p \qquad \text{(xiv)}$$

To complete the analysis, note that (xix) gives the excess flow demand for goods and services while (xiv) gives the excess flow supply for domestic financial assets. The difference between the two is the excess flow demand for foreign financial assets. In a floating exchange rate regime, the rate will adjust to eliminate this excess flow demand; if we postulate a Marshallian adjustment process, we have

$$\dot{E}/E = e + f\left(\frac{D}{P} - \frac{K}{P}\right) \qquad \text{(xx)}$$

where

e is the expected value of $\dot{E}/E$

f is the market speed of adjustment to the excess flow demand

If we now substitute (xix) and (xiv) into (xx), we obtain the expression linking credit and the exchange rate as

$$P\left(\frac{\dot{\Delta E}}{E}\right) = \frac{(\dot{\Delta C})\ (1-Y) + Yfq - a)}{1 - \alpha\beta f} \qquad \text{(xxi)}$$

The interpretation of expression (xxi) is very similar to expression (xvi), in the fixed rate case. Again, credit policy has three channels: (i) through credit displacement; (ii) through income/expenditure effects; (iii) through demand for money effects. There are also similar policy implications. Just as in the case of fixed exchange rates credit creation has an immediate and substantial impact on reserve flows, so in the floating case, it has an immediate impact on the exchange rate. Monetary policy then becomes a substitute for reserve intervention policy. In addition, the size of the effect will depend systematically on what proportion of new credit extended is advanced the government and private sectors, respectively.

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