

# 5. Monetary Targets and Economic Policy

## Control of Monetary Aggregates

### Monetary Control: Supply and Demand

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Mr Middleton

cc Mr Bridgeman  
Mrs Lomax  
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MONETARY CONTROL : SUPPLY AND DEMAND

You asked me to attempt to crystalize the analysis of money supply and demand which was discussed at your meeting this morning.

2. Consider first a closed economy. In this situation, the authorities have absolute control over the nominal quantity of money in the economy. The creation process is described by the relationship.

$$\Delta M = \text{PSBR} - G + \text{BL} \quad (\text{i})$$

where

- M = the increase in money  
PSBR = the public sector financing requirement  
BL = bank lending  
G = sales of government debt

3. There are no external adjustments by definition in this world and non-deposit liabilities are ignored. The authorities have complete control over each of these three components and hence they can control  $\Delta M$  in total. PSBR is controlled by expenditure or fiscal policy ; BL is controlled either by direct restraints on bank lending or by reserve asset base controls as in the Competition and Credit Control system. Gilt sales G can be controlled, provided the authorities do not wish to control interest rates, merely by setting the sale price sufficiently low to attract demand for as many gilts as it is wished to sell.

4. By contrast, the demand for money is controlled by the (non-bank) private sector. It is assumed that it is the real volume of money which is important whether the motive for holding the money is as a transactions balance or as a store of value. Demand is taken as positively related to income and wealth and negatively to nominal interest rates. Income is taken as a proxy for total transactions in the economy, thus determining transactions demand for money while wealth measures the total portfolio available for holding in assets and thus relates to the store of value demand for money.



The nominal interest rate measures the opportunity cost of holding money rather than bonds or goods and has therefore a negative effect on holdings. Thus the demand function is

$$\frac{M^D}{P} = f \left( \frac{Y}{P}, \frac{W}{P}, i, \dots \right) \quad (ii)$$

where

- $M^D$  = the demand for money in nominal terms
- $P$  = the price level
- $Y$  = nominal income
- $W$  = wealth
- $i$  = the nominal interest rate

5. In practice the instantaneous recognition of changes in the price level which (ii) implies may not be realistic i.e. the demand function may not be homogeneous in prices in the short term. However, it seems reasonable that there will be homogeneity in the long run. Thus demand for money function would be

$$M^D = f \left( Y, W, P, i, \dots \right) \quad (iia)$$

with the restriction that in the long run a 1% rise in  $P$  creates a 1% rise in  $M^D$ .

6. Now, for given real income, wealth, price level and interest rate, there is no reason why the money supplied by the authorities  $M$  should equal the demand for money  $M^D$ . Suppose the supply exceeds the demand. Any individual in the society can always remove his excess money holdings by spending them. But if the authorities refuse to take the excess money out of circulation, then the society as a whole cannot get rid of the excess in this way. One individual spending his excess money holdings merely passes on the money to another individual whose disequilibrium is therefore made worse. As all individuals try to spend their excess balances, there is a process of competitive bidding for resources. If the economy were initially at less than full employment there may be a transient increase in output to meet this new demand but the final result will be an increase in the price level proportionate to the initial excess supply of money. Only at this position will the supply of money and the real demand for money be in equilibrium and there will be no further tendency for the economy to react.



7. In this framework - the Chicago tradition of Friedman and Patinkin - the role of the monetary target is to control the money supply. It should be set in such a way that, given knowledge of money demand, the resulting demand/supply disequilibrium will react back onto output and prices in a way which is considered desirable. The aggregate for which we set a monetary target must therefore have two attributes :-

- It is in this sense that the demand function should be well determined;*
- a) it must be possible to control its supply ie there must be a relationship like (i);
  - b) the demand for that aggregate must be stable ie (ii) must be well determined, otherwise we cannot tell very clearly what the effects of a supply/demand disequilibrium will be.

*Point is this criteria would apply to*

8. In my view, consideration (a) above rules out M1 as a suitable aggregate for targetry. For which of the other aggregates, the base, M3 or M5, we should set a target depends on which, if any, has the most stable demand function. That must be an empirical matter rather than one which can be decided by a priori theorizing alone.

9. The analysis is more complicated for an open economy, and depends on whether there are fixed or floating exchange rates. In the fixed rate case, since the private sector has access to the Exchange Equalisation Account, in the absence of perfect exchange control the authorities lose their control over the money supply. The supply equation becomes effectively

$$\Delta M = \text{PSBR} - G + \text{BL} + \Delta R \quad (\text{iii})$$

where

R = the level of reserves

10. Because of their commitment to maintain the exchange rate, the authorities cannot as well control R and hence they cannot control M. The authorities monetary stance in this case is not measured by the monetary expansion  $\Delta M$  but by the credit expansion  $(\Delta M - \Delta R)$  since the authorities do still control this aggregate. This is the justification for a DCE target.





11. In this situation, any putative disequilibrium between the money supply and demand may be resolved in two ways: as before, the price level may change to make the equation. But, in addition, the disequilibrium may disappear across the exchanges. If supply is below demand, there will be a tendency for foreign funds to flow in, while if the money supply exceeds, funds will tend to flow out. Both mechanisms may be active in practice and it is an empirical question which is stronger in the short and long runs.

12. With floating exchange rate the authorities are able to determine  $R$  so that control of the money supply is restored. A monetary rather than DCE target is relevant in this case. All of the adjustment of money supply to demand must now ultimately be via the price level but the effect may come in two ways. First, there may be a direct domestic effect as in the closed economy case. In addition, with fixed reserves the excess money supply will tend to change the exchange rate. In time, this will change the domestic price of tradeable goods. Thus, the domestic price level is affected indirectly by the excess supply. This latter channel is the one which the "international monetarists" tend to emphasize.

*The suggestion that M1 should be suitable target variable seems to be correct.*

13. By sharp contrast with all this, ~~the Bank of England paper is very purely (Keynesian) in its approach. Their theory is based on the premise that the authorities either cannot or should not contract the money supply direct but instead should use interest rates to control the demand for money. Note that by controlling the nominal interest rate, the authorities thereby automatically lose control of the money supply because they have to supply government debt passively at whatever interest rate they deem appropriate. Since both money demand and supply are then determined by the private sector, there is no possibility of their diverging. There are therefore no disequilibrium effects on either prices or output.~~

14. In this situation, the sole function of a monetary target is to set, implicitly, an interest rate target. Any effects on the rest of the economy must therefore operate through changes in interest rates. This is a perfectly consistent position but there are at least two (major) difficulties *but it does not seem to have much to base it on*

*The general level of interest rates and guide for central banks in changing it.*

*15/11/1971*



a) if monetary policy really operates only through interest rates why not set the interest rate target direct at some level deemed to be optimal, rather than set a monetary target:

b) the empirical evidence suggests that interest rates have very little effect on the real economy, certainly over the range of variation we have seen in the past. Quite intensive searches for interest rate effects on expenditure function, both inside the Treasury and outside, have failed to reveal any substantial influence. <sup>by the way, has not</sup> A Fortiori, the effect on the price level of interest rates must be minuscule. If this is the case, however, why should we expect at <sup>the level of</sup> this version of monetary targetry to have any effect on the economy, beneficial or otherwise? <sup>much effect of the target</sup>

15. These two views of monetary policy are quite different in their implication for targetry. In the Bank model, it is not important that the supply of M1 cannot be controlled. The sole criteria for choosing the target aggregate is how closely it may be related to interest rates. Presumably, the Bank would argue that M1 is the best variable on these grounds. But in the absence of satisfactory responses to the points in paragraph 14, it is difficult to accept this argument.

16. The above considerations are by no means a complete analysis of monetary targets. Mr Bridgeman mentioned a number of other important issues, notably the effect of targets on expectations and their role as aids to monetary policy decision - making. On the other hand, I do think that this analysis is an important element in the problem and are which needs to be borne in mind when considering the other issues.

J. W. Guice

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## MONETARY POLICY AND THE REAL ECONOMY

This note considers the impact that the various monetary aggregates may have upon the economy. By implication, we therefore also consider what effects controlling each or any of these quantities is likely to have upon the macro-economy. It does not consider what efficiency and other microeconomic effects controls may have on the financial industry. Whilst these are of considerable importance in themselves, the required analysis is rather different. The note is in two parts: in the first, shorter, part, we consider the possible candidates for control; in the second, the links with the rest of the economy are examined. Three major headings are reviewed - effects on the price level, on the volume of domestic activity and, finally, on the balances of trade and of payments. As we shall see, these effects are interconnected.

### A. The Characterization of Monetary Policy

In this section, we review the quantities which might be considered as control magnitudes for monetary policy. Before we begin, however, I want to delineate the subject matter of this note, the effects of monetary controls, from two apparently related but substantially different questions. In analysing the consequences of various controls, one needs to know how the controllable magnitude affects the rest of the economy and to determine therefore what the effects of the control will be. That is what we consider here. The two related questions are these: i. what is monetary policy and how does it differ from fiscal policy; ii. what is the appropriate measure of monetary policy. Even if it were possible to provide an answer to these questions, that answer could not, in my opinion, be of any value.

Fiscal policy is usually thought capable of fairly precise measurement, at least at macroeconomic level. The PSBR is normally used for this purpose usually calculated at some fixed employment level so as to remove or at least standardise its endogeneity\* and,

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\*See, for example, Okun and Testers (38) for the United States and Hartley and Bean (22) in the UK

in more sophisticated attempts, adjusted for the effects of the inflation tax on government debt outstanding. The problems about finding a similar measure for monetary policy is that movements in monetary variables can evidently be induced by fiscal policy alone. Thus, a reduction in income tax rates not offset by a fall in government spending or debt sales may increase the money supply. There are several ways out of this conundrum: one can be strictly logical and claim that the tax change is itself monetary policy - most monetarists would argue thus. A second way is to define monetary policy sequentially on the PSBR so that monetary policy is the growth in money supply relative to the PSBR. Thirdly one can define monetary policy, institutionally, as government policy bearing on interest rates, debt management and the behaviour of the financial system; this is the presumption underlying, for example, Professor Sayers' writings on monetary policy and might correspond roughly to the remit of our own monetary Policy Group. One could devise other sensible definitions of monetary policy. As labels or descriptive terms each of these is acceptable but it is necessary to specify in discussion precisely which label is being used. Much academic and public policy debate, particularly between monetarists and the rest, has been unnecessarily confused by failure to agree on which convention is being used.

Two conclusions follow from this discussion. First, there can be no unique measure of monetary policy because there is not universal agreement on the definition of monetary policy. Secondly, and less trivially, if one selects a definition of monetary policy which allows operation on more than one policy instrument then there arises the possibility that these instruments will exert different effects. For example, policy involving high interest rates but rapid monetary expansion may exert a contractionary influence on the corporate sector of the economy but an expansionary effect on the consumption sector. In this circumstance, no single measure of monetary stance is possible and, moreover, any attempt to find one would obscure the true effects of policy.

It would seem better, therefore, to steer well clear of these theological debates with regard to the definition of monetary policy and how to measure it. Instead, we characterize policy by the behaviour of a number of quantities and consider how changes in each of these might influence the economy. In the remainder of this section, these quantities are defined and technical and statistical issues (as opposed to economic ones) discussed.

1. The Monetary Base. This may be important either because of its effect on the higher monetary aggregates or because of direct effects via a money multiplier on nominal national income. In monetarist writings (see, for example, Burger (8)), the monetary base (or high-powered money) is defined as currency held by the public and by the banks plus net government liabilities held by the banks. While this definition is relevant to the United States institutional content, it has little meaning in the United Kingdom since it is not these holdings which determine the banking system's ability to create deposits. In this context, therefore, one is more likely to be interested in the banks' holdings of reserve assets, corrected over time for effective changes in the minimum reserve ratio. These reserve assets are defined as i. banks' holdings of Treasury Bills; ii. lending at call to the discount market; iii. commercial bills up to 2% of eligible liabilities; iv. local authority bills; v. gilts with less than one year to maturity; vi. bankers' balances with the Bank of England.

Since we are primarily interested in the reserve asset base as determining the maximum deposit creation possible by the banks, it may not be actual reserve assets which are relevant but rather the maximum obtainable by the banks at their own discretion. Such a series is not difficult to construct as Pepper and Thomas (41) note.

2. The 'Narrow' Money Supply M1. This is defined as notes and coin held by the public plus bank deposits, obtainable on sight, by UK residents. The only statistical issue here is whether or not interest bearing deposits should be included in the aggregate to be controlled. Since May 1975, the published series have included such interest bearing deposits and these have almost certainly been

responsible for much of the high-frequency variation in the series. There is a strong case, however, for leaving these deposits in the M1 series. M1 is characterized particularly by the fact that almost any transaction may be effected by its use. It is thus the archetypal medium of exchange. Sight deposits, whether interest-bearing or not, may be used for this purpose. On the other hand, there is reason to believe that interest-bearing deposits are predominantly corporate-owned assets. Thus, if we are interested primarily in personal sector economic behaviour, we may want to exclude them.

3. The 'Wide' Money Supply M3 and £M3. M3 is defined as notes and coin held by the public plus UK residents' holdings of sight and time deposits with the banking system. £M3 is of the same form but excludes any foreign currency deposits. Unlike M1, time deposits may not themselves be used as a medium of exchange but since they may be converted virtually at will into such form, they are often regarded as transactions balances. On the other hand, they may also be regarded as speculative stores of value since they earn a rate of return. A problem with this interpretation is that it is difficult to see why time deposits are so large. Personal holdings of time deposits are at least £m1000 and most of these holdings could obtain a higher rate of return if invested in the Building Society movement, at no extra risk. The fact that substantial time deposits are not invested in this way leads one to suspect that they are predominantly of a transaction and not a speculative nature.

Foreign currency holdings by UK residents can clearly not be used for domestic transactions but do represent wealth. Whether one wishes to concentrate attention on M3 or £M3 will therefore depend on whether one regards the medium of exchange or store of value role of money as most important.

Both measures are subject to a number of statistical problems:-

a. Probably the most important of these is the arbitraging phenomenon known as 'round-tripping'. It occurs when the yield on CD or wholesale bank deposits is greater, for some reason, than the



cost of a bank loan. In this case, prime credit-rating bank customers will find it profitable to take out loans to their full ability and redeposit them in the wholesale market. This effect, which can be very large, is most likely to happen when the banks are under reserve asset pressure and bidding actively for deposits in the wholesale market. It seems fairly clear that this phenomenon can have little effect on the real part of the economy and should be discounted as far as possible.

b. The supplementary special deposits scheme (SSDS) was introduced partially to prevent round-tripping but itself can be an important cause of a second distortion, "soft arbitraging". The main reason for this phenomenon is that the public's holding of liquid public sector debt is not included in M3 while its holding of equally liquid banking debt is. When the SSDS is in operation, banks are not likely to bid aggressively for deposits with the result that liquid funds will build up in Treasury and local authority bills rather than in M3. Thus, in a sense, the series for M3 will understate the true liquidity of the economy. Alternatively, if the banks are under reserve asset pressure, the consequent bidding for funds will drive rates on banking debt above that on liquid public sector debt. Liquidity will then be concentrated to a more than usual extent within the definition of M3 and its level may overstate the liquidity of the economy relative to other periods. It may be, however, that this distortion is relevant to the real economy. Treasury bills, unlike bank deposits, cannot be used to finance transactions. If it is the case that M3 is relevant as a medium of exchange and not in its role as a store of liquidity, then soft-arbitraging will not be a problem in the analysis.

c. Anticipation of an SSDS may also distort the series. If individual banks believe a guideline is about to be imposed, then they may bid to obtain as high a base level for interest-bearing eligible liabilities (IBELS) as possible in excess of what their current earnings opportunities would call for. At the same time, these banks are likely to run down their own assets which offset IBELS, in particular CDs, interbank loans and loans to discount

houses. These assets will be sold to the non-bank private sector who in turn will increase their holdings of banking paper. Hence, on both counts, M3 will be increased artificially. It remains true, though, that the private sector have been induced to hold more of their portfolios in a medium of exchange rather than in other stores of value. Again, therefore, if one believes that M3 influences the economy primarily through this transaction function, these "distortions" should not worry us unduly.

4. Total Liquid Assets M5. This aggregate is built up of all of the components of M3 plus UK residents holding of Treasury Bills local authority temporary debt, national savings and building society deposits. As it stands, this series is defective in that it embraces assets held primarily by companies as well as national savings and building society deposits which are held virtually entirely by persons. However, separate series for personal holding of liquid assets are available and company holdings can therefore be derived by residual. Technically, the advantage of this series as compared to M3 is that many of the distortions will net out. Unfortunately, 'round-tripping' which is probably the largest distortion and probably, from the above discussion, the most important for the transmission mechanism will not disappear. Furthermore, whether it is an advantage to control all liquid asset rather than just bank deposits will depend on whether it is liquidity or transaction balances which are most important to economic activity. A question arising from this issue is whether building society deposits, quantitatively now over three-quarters the size of M3, should be considered a medium of exchange. At first glance, the answer must be no, since cheques are not usually issued on such accounts, nor would they be acceptable. On the other hand, people may arrange their expenditures as if their bank deposits included their building society assets, confident that these assets could be transferred if required. Whether in fact people do behave in this way, it is not possible to tell a priori and only the data can tell us.

5. Interest Rates. Interest rates are interpreted as the cost of borrowing or the return to lending. Whichever rate is relevant will depend upon whichever lending or borrowing we are concerned with. There may therefore be many interest rates which we are interested in and there is no reason to suppose that they will move at all together, (of itself, this provides a good example of the futility of finding "an indicator" of monetary stance).

Which borrowing or lending we are concerned with will also indicate whether a nominal or real interest rate is relevant. For example, the cost of holding money rather than lending in the form of buying bonds or investing in real assets is clearly the nominal rate of interest while the cost of borrowing in order to invest in inventories of physical goods is clearly the real rate of interest. Both real and nominal interest rates are therefore relevant in general, depending on the specific circumstances of the analysis.

6. Domestic Credit Expansion. Turning now to banks' assets rather than their liabilities, the widest credit measure for the economy is DCE. Although strictly a credit measure, it has usually been used to measure domestic monetary creation, that is, the money which would have been created, on the wide definition, if there had been no change in the official reserves.

As a measure of credit, a major deficiency of DCE is that it does not distinguish the recipient of the credit, whereas this is likely to be important. In particular, the credit advanced to the public sector is likely to have a very different effect on the economy to that advanced to the private sector. A further difficulty occurs in obtaining a stock of domestic credit since DCE itself is a flow. In principle, this difficulty can be overcome, however, if need be, since we have the stocks of banks assets as well as the cumulated stock of external credit given to the public sector. Finally, it is unfortunate that DCE throws into shadow non-bank domestic credit transactions. In particular, the behaviour of building societies and hire purchase firms does not figure implicitly in the calculation

at all, in spite of the very large advances which both of these institutions make. These considerations suggest that it may be better to look at more disaggregated credit measures.

7. Bank Advances. Since the new banking returns have been introduced, a comprehensive analysis by sector of bank advances has become available. Of itself, however, this information may not be what is required. As we shall see below, in most cases what is required is not the absolute level of advances but the demand for advances which is not satisfied. Measures of this excess demand - even indirect ones such as the proportion of loan applications rejected - are not readily available. Of itself, this does not imply that bank advances are not suitable candidates for control: quite the reverse, since the degree of excess demand will depend in part on the available supply after control. But it does imply that controls on bank advances may have effects which are difficult to predict since the desired level of bank advances, as opposed to their actual level, is not observed.

There are two statistical points to be noted. First, the round-tripping noted in connection with M3 also affects bank advances. Most of this effect is likely to have occurred in advances to companies since persons are not normally prime-rated borrowers. As with M3, this distortion is likely to have had no real effects on the economy and should be discounted as far as possible. Second, on the personal side, there is no information to show what proportion of total advances are in the form of overdrafts and what as fixed rate personal loans. This lack of knowledge is irrelevant to the effects of monetary policy in the economy but does have a bearing on how easily personal advances may be controlled.

8. Building Society Advances. Just as M3 may be misleading as a measure of liquidity in that it ignores building society deposits, consideration of bank credit alone may ignore an important monetary influence on the economy. Whilst it is true that these advances are ostensibly made only to persons for purchases of housing, their

effects may not be as specific as this. They represent a cheap source of finance for most people and, particularly at times of credit rationing, consumers may overrepresent their needs for housing finance and divert the surplus to other uses. Effectively, therefore, they may take the place of other forms of consumer credit. On the other side of the coin, it should be noted that not all loans for house purchase are made by building societies. Other lenders, local authorities, insurance companies, public corporations and banks, provide an average about 15% of the total and, in times of severe building society credit rationing, have provided up to a third of the total.

9. Consumer credit. In general, this is taken to refer to credit to consumers provided by non-banks, principally finance bases and retailers. The main point to note is that consumer credit may spill over to other uses; just as can building society finance. The majority of such credit is advanced to persons, probably about 80%, but a significant proportion nonetheless does finance corporate purchases.

To conclude this section, it is worth noting two main points which have emerged:-

a. there is no single measure which can characterize monetary policy, and any indicator which attempted to do so would obscure rather than illuminate. Monetary policy may operate on any of the above measures and there is no reason why they should move together or, indeed, why it would <sup>be</sup> appropriate for them to do so. It can be characterized, rather, only by overall consideration of all of these measures, noting the statistical and technical peculiarities of each;

b. of the monetary aggregates themselves, which we believe is most important will depend on whether we judge money's main role to be a medium of exchange or as a store of liquid value. If the former, M1 (or to a lesser extent M3) will be the most important aggregates to control. If the latter, M5 is the more relevant. This question can only be decided by empirical analysis.

#### B. The Transmission Mechanism: The Domestic Model

Traditionally, Keynesian and monetarist theories of price determination are contrasted. While conceptually this distinction

may not be very helpful, it may be useful presentationally and we follow it here.

Of oldest vintage by several centuries in price hypotheses is the quantity theory. Irving Fisher (13) is usually taken to have provided the first modern statement using the equation of exchange

$$MV_T = PT$$

where

M is the money stock

P is the price level

$V_T$  is the transactions velocity of money

T is the volume of transaction

Fisher asserted that  $V_T$  was constant in the longer term (not in the short term: indeed he had a complete theory of the business cycle based on its short term volatility). Now of itself, this equation is of no value in macroeconomics since we are not interested in total transactions but only final ones. The relationship between these two concepts will depend on many factors, notably the level of financial activity, the degree of vertical integration within industry and any imputed final transaction to which no real transaction corresponds. These factors are not likely to be constant and so, even if  $V_T$  were constant, it is unlikely that  $V_Y$  would be constant in the relevant macroeconomic equation -

$$MV_Y = PY$$

where

$V_Y$  is income velocity of money

Y is national income

Walters' empirical analysis (50) confirmed this in the UK and there is similar evidence for the United States.

Fisher was quite clear that only the medium of exchange was relevant to his theory. He therefore allowed only currency in his definition of M, excluding even bank deposits. This admirable

clarity was obscured, however, by Friedman's restatement (16) of the quantity theory in which the centre piece effectively became the demand for money.

$$M^D = f(Y, P, r^m, \underline{r}^c \dots)$$

where

$M^D$  = the demand for money

$Y$  = income (or permanent income or wealth)

$r^m$  = the own-rate of interest on money in nominal terms

$\underline{r}^c$  = the vector of competing nominal rates of interest

Friedman did not concern himself with whether his money stock was for purely transaction purposes or could be held as a speculative asset. His own subsequent empirical work (17) failed to find any interest rate effects suggesting that it was transaction balances which were important but much subsequent work, reviewed, for example, by Laidler (30), has found significant interest rate effects, suggesting that the asset role of money is also important. A further problem with this work was that the role of money supply was not made clear. Friedman (Mark II) (19) dealt with this explicitly. Following Patinkin (40), the demand for money is taken as homogeneous of degree one in prices. All this really implies is that the demand is independent of the units in which money is accounted. While the demand for real money balances therefore depends on the collection of individuals in the economy, the supply of nominal money is taken to be controlled by the government, either because government fiat money, issued in part finance of expenditure, is the only money in the system or because, in a fractional banking system, the government controls the reserve base. Disequilibrium in this system only arises if, at the going price level, ex ante supply and demand of real money balances diverge. In a closed economy where supply exceeds demand, this can only come about by a rise in the price level reducing the supply of real money balances until they equate with demand. The mechanics of this adjustment come from the fact that individuals in society,

feeling out of equilibrium, will attempt to purchase real goods and services to remove their excess real balances. Since this process does not extinguish the money, once created, the only result is a driving-up of the price level until equilibrium is restored. A fall in the price level is entailed if demand for real balances exceed supply.

Two conclusions follow from this analysis: i. the aggregate we are concerned with must be the one which is implicitly controlled by the government's fiscal position: ii. it must be one for which there is a stable demand. Consideration i. would appear to rule out M1 as an interesting aggregate in this context.

Keynesian analysis is normally conducted in terms of IS/LM curves. This is most applicable, as in Hicks' original article (24), when the price level is fixed, and in this case is obviously useless for analysing inflation. It is possible to amend the analysis to allow a variable price level (see Bailey (3)) but the resulting model is cumbersome and difficult to apply. Keynesians have therefore concentrated their inflation analysis on the Phillips curve. Keynes himself introduced the concept under the guise of the "aggregate supply function" (27) and it was Phillips (43), some twenty years later, who provided initial empirical justification.

These original curves were of simple form:-

$$\dot{W} \text{ (or } \dot{P}) = f(U) \quad f' < 0$$

where

$\dot{W}$  is the rate of change of wages

U is unemployment

Later, following criticism by Lipsey (32), a price term was introduced into the equation and a further equation added to the system linking prices to wages -

$$\begin{aligned} \dot{W} &= f(u, \dot{P}) & f_u < 0, & f_p > 0 \\ \dot{P} &= g(\dot{W}) & g' > 0 \end{aligned}$$

This model is really only the embodiment of the wage/price spiral;



with unemployment (and possibly import prices if added into the price equation) controlling the start of the spiral. Intuitively, one would expect the spiral to be damped, not explosive, and Dow and Dicks-Mireaux (11) estimated the system with the parameters turning out to have this property.

The model was attacked, however, on two fronts. Empirically, the model broke down badly in the seventies, failing to account for the worsening of unemployment accompanied by accelerating inflation. Attempts to shore up the model by, for example, Parkin (39) or Lipsey and Parkin (32), who tried to incorporate the effects of incomes policy, provided only temporary respite. At the same time, the model came under attack on theoretical grounds, most forcefully by Phelps (42). His argument was that the Phillips curve embodied an incorrect view of the labour market. Labour will optimize its return by demanding its marginal product as the real wage rate. Higher wage rates will create unemployment and lower ones will mean employees giving part of their services for free. Hence, high unemployment may be consistent with high absolute wages but cannot cause high wage inflation over and above any price inflation. In this case, wage bargaining will be in terms of labour trying to compensate for the expected inflation over the new wage contract period. Changes in marginal product will also be relevant but these are likely to be independent of unemployment positions. These considerations suggest the expectations augmented Phillips curve, of form:-

$$\dot{W} = f(U, \dot{P}^e) \quad f_U^s \leq 0 \quad f_U^L = 0$$

where

$$f_{P^e} > 0$$

$\dot{P}^e$  = expected price level

U is non-zero only in the short-run in this equation, while the long run coefficient on  $\dot{P}^e$  must be close to unity, only differing if expectations are systematically mistaken. Operationally, the main difficulty with this model is to specify how price expectations are formed. Clearly, if they are formed by reference to the behaviour of one of the measures of money supply then that would be a most

important link between monetary policy and wages and prices.

An empirical review of these models for the UK was carried out by Henry, Sawyer and Smith (23). Unfortunately, they found that none of these models explained UK price behaviour at all well. Admittedly, their version of the augmented Phillips curve had expectations formed adaptively but Laidler's model (28), (29) where expectations were formed with reference to the money supply performed no better.

It may be possible to combine the Keynesian and monetarist approaches. Friedman (Mark III) (20) admitted that his earlier analysis of itself only allowed the prediction of nominal incomes. Only at full capacity need the action of society trying to spend its unwanted real balances push up prices; at less than full capacity, there may be output growth to match the increased expenditure. Indeed, this is precisely what the Keynesians claim will happen with no increase in prices until capacity is sufficiently full to make the Phillips curve positive. The general problem then is to split down an increase in nominal income into observed real output growth and price changes. Expressed in this way, the obvious solution would seem to be to use supply/demand analysis with aggregate output on one axis and the aggregate price level on the other.

It is moderately easy to characterize the aggregate demand schedule. In general, it will slope downwards with respect to the price level and the steepness of the curve will depend on how non-homogeneous in prices are the private sector demand equations. Demand is normally taken to depend upon individuals' command over real resources ie their wealth. Part of this wealth is likely to be held in financial forms which are denominated in money terms, notably holdings of money and government debt. Thus a rise in the price level will reduce the real value of wealth and hence reduce demand. Mutatis mutandis, a fall in prices will increase demand, giving the negative sloping demand curve.