

19) PURSUIT OF MONETARY TARGETS – PART A
12TH AUGUST 1977

The Pursuit of Monetary Targets

Jeremy Bray NOM.

The Bank of England Quarterly Bulletin (June 1977) has put questions regarding the use of targets in monetary policy, suggesting they deserve public discussion. My suggestion is that both in the clearer formulation of the questions, and in their practical solution, newly available stochastic control theory methods have a role to play, not in some distant future when credible complete econometric models are available, but now.

First the questions. The Bulletin commentary points out that over the past four years M_3 grew on average 10% a year and GNP at current prices about 20% and for the past six years, the velocity of circulation of both M_1 and M_3 has been far from stable. Even an elaborate lag structure does not produce a very good relation between money supply and money GDP. The proportionate errors are an order of magnitude greater than those usual in national income forecasting. This does not offer a very promising justification or basis for monetary policy.

However accepting that there may be more complex relationships between money supply, or components of money supply and other monetary variables, and components of GDP and their deflators; and accepting that monetary targets are being set, the Bulletin commentary asks what variables should be used, how should they be measured, and how should the targets affect the evolution of policy? Should it be M_3 , or M_3 and M_1 , or DCE, or DCE and PSBR, or DCE, PSBR and M_3 ? Should targets be set for successive years, or "rolling targets" for the year ahead? Can one month's figures indicate a trend? Will weekly figures reduce the lag? Will the effect of short term fluctuations be smoothed out, and so can they be ignored?

Other/

Other relevant questions are: what actions should then be taken? What are the penalties for delaying action? Is the action very sensitive to the choice and treatment of the target?

The framework within which these questions can be formulated systematically is to define the objectives to be sought, and then to find the use to be made of available instruments in seeking these objectives.

Taking the very simplest of monetarist models, suppose it is argued that M_3 should be allowed to grow at the rate at which GDP can grow without inflation, or with very little inflation. Suppose furthermore that this is defined to be the rate at which GDP, or productive potential or a full employment GDP, has in fact grown over a past period, and the period has been chosen, a growth rate calculated, a base point fixed, and so a trajectory defined. Suppose furthermore it is possible to control M_3 to follow closely the desired trajectory. A monetarist accepting the model may expect that after a period, the balance of payments, unemployment and inflation will settle down to acceptable levels. But more realistically he will expect that there would be long term deviations from acceptable levels, and the desired trajectory for M_3 would have to be modified in the light of experience. There was after all nothing ultimate in the original choice of trajectory. The questions then is how should the trajectory be adjusted?

It should be adjusted so as to bring the balance of payments, unemployment, and inflation down to the most acceptable available levels.

The relation between the number of instruments and the number of objectives does not make this a nonsensical objective, since in a stochastic system there is no question of the exact achievement of objectives in any case. It is a matter of bring/

having a preference to move a variable in one direction rather than another, and the monetarist will argue the system will help to move all or most variables to the best available levels.

The objective function therefore combines a money supply target and balance of payments, unemployment and inflation targets, the latter, for the monetarist, being essentially a trim of the former. If the monetarist can supply a model showing how the balance of payments, unemployment and inflation are affected by money supply, then that would be sufficient for him. But no such empirical model of the UK is available, which could be made the basis of such a control method. If we worked with a single equation monetarist model alone, forecasting only money GDP from money supply, then there would be no trim to correct drifts above or below productive potential.

It would however be possible to work with the Treasury model which still gives scant treatment of monetary variables, with the money supply being controlled to a trajectory chosen on monetarist arguments, and the whole battery of fiscal instruments being used to trim to correct drifts of the balance of payments, unemployment, and inflation, compatible with the money supply target.

The form of such an objective function might be to minimise

$$Q = \sum_{t=1}^{16} a_0 (M_t - M_t^0)^2 + a_1 (B_t)^2 + a_2 (U_t - U_0)^2 + a_3 (\Delta P_t)^2$$

where

M_t = money supply M_3

M_t^0 = money supply target

B_t = current balance of payments

U_t = unemployment

U_0 = target unemployment

*actually a target or does this just
redefine the ability function?
target*

having a preference to move a variable in one direction rather than another, and the monetarist will argue the system will help to move all or most variables to the best available levels.

The objective function therefore combines a money supply target and balance of payments, unemployment and inflation targets, the latter, for the monetarist, being essentially a trim of the former. If the monetarist can supply a model showing how the balance of payments, unemployment and inflation are affected by money supply, then that would be sufficient for him. But no such empirical model of the UK is available, which could be made the basis of such a control method. If we worked with a single equation monetarist model alone, forecasting only money GDP from money supply, then there would be no trim to correct drifts above or below productive potential.

It would however be possible to work with the Treasury model which still gives scant treatment of monetary variables, with the money supply being controlled to a trajectory chosen on monetarist arguments, and the whole battery of fiscal instruments being used to trim to correct drifts of the balance of payments, unemployment, and inflation, compatible with the money supply target.

The form of such an objective function might be to minimise

$$Q = \sum_{t=1}^{16} a_0 (M_t - M_t^0)^2 + a_1 (B_t)^2 + a_2 (U_t - U_0)^2 + a_3 (\Delta P_t)^2$$

where

M_t = money supply M_t

M_t^0 = money supply target

B_t = current balance of payments

U_t = unemployment

U_0 = target unemployment

*actually a target or does this just
restate the ability function?
target*

money GDP. Although the argument by which it does so may be dis-
 the "with policy change" numbers for money GDP will (by definiti-
 available. The money supply is then adjusted by the money supply
 objective function to match the expected future money GDP; the
 say, to produce the expected money GDP. Full allowance is made for
 effect of money supply on money GDP.

Provided the model satisfies certain conditions, both the
 Treasury modeller should be satisfied. Monetary policy will fol-
 but broadly and on average, correcting for past excursions by fu-
 the path required for the smooth non-inflationary growth of money
 Treasury's "with policy change" forecasts always try to converge
 modeller should be satisfied because while he may place no great
 efficacy of monetary policy, he will be allowed a set of fiscal
 with the monetary policy, which on their own and according to the
 should take the economy along the desired course.

*in practice is
 (a) model diff
 (b) ind of path*

To achieve this happy end the conditions to be satisfied are
 the system it represents) should be sufficiently rich in availab-
 Whether it is, is not a simple question. It can however be answer-
 will be happy: his instrument of the money supply will be nicely
 objective. To satisfy the Treasury modeller, the combined policy
 with the policy indicated by an objective function identical but
 term omitted. The two policies should be compared both in the v-
 pending parts of the objective functions, and in the detailed ev-
 and the forecast outturn. Experience suggests they will be very
 combined policy will show a more firmly controlled (not necessar-
 policy.

20/

*Differences will be due to greater weight given
 there imply monetary (V) changes with
 on the any money eqn $M=f(V)$ alone
 or because $V=f(M)$ in FTT model?*

To decide which monetary objectives are relevant, at this stage of development of monetary policy an empirical test is to see whether M_1 alone or M_3 alone, or M_1 and M_3 together offer the best control of money GDP Y , using single equation general ARIMA lagged predicting relationships. If it turned out that M_1 and M_3 together provided the best control, then it would be necessary to see whether the relative movements of M_1 and M_3 would be compatible. If constraints on relative movements had to be imposed they would become either a part of the model, or of the objective function, with some deterioration of performance which would have to be taken into account in considering whether any advantages remained over using M_1 or M_3 alone.

The positions of DCE and PSBR are somewhat different. DCE was introduced to provide a monetary instrument for correcting a balance of payments deficit. Although the rationale has been used by the IMF in many loan operations, the original rationale (Polak, 1958) was a rough improvisation for simple economies ignoring price and exchange rate effects, and neither originally nor subsequently has it had a sound empirical basis. However the need to consider the interaction of the money supply and the balance of payments is valid, and is provided for in the proposed argument.

Similarly PSBR, if not as a single variable, then in its component parts also plays a part in the proposed argument.

To achieve satisfactory control it is helpful to include not only the rates of change but also levels in the objective function, with the balance between rate and level affecting the emphasis on smoothness or tightness of control.

The/

The control algorithm needed

The above method is practicable now, if use is made of Chow's non-linear optimal control programme. Chow (1977) suggests how his algorithm might be used in macroeconomic policy formulation. Butters & Chow (1977) gives a User's Guide to an available Fortran program implementing the algorithm. Chow and Megdal (1977) gives results from the use of the program on the large scale Michigan Quarterly Econometric Model of the US.

Chow (1977) gives 12 steps in a suggested procedure. The application I have suggested makes modifications relating to the setting of the objective function, which in any case must be a process of iteration, not only between policy makers and modellers, but between policymakers and modellers with different points of view - in our case represented by monetarists and Treasury modellers.

Chow suggests setting target values for important economic variables which are somewhat more desirable than those given by current policy proposals, and weighting according to the relative importance of variables. These two however interact. For example a variable given high weighting which is near its target may be improved less than a variable which is given low weighting but is a long way from its target. I have suggested (Bray, 1975) that a convenient way of setting both target values and weighting is to ask what is the priority of a marginal improvement in each important variable at different levels of that variable (and if desired at different levels of other variables too). The resulting priority line (or surface) is given by equating to zero the partial derivative of the objective function Q with respect to the variable. Conversely the priority line determines both the target (by its intercept with the axis) and the weighting (by its slope) in the objective function.

It/

It is perfectly acceptable (and indeed probably realistic and desirable) to set the target well beyond the range of the attainable. The model will see that it is not attained, but the priority will be maintained in balance with other priorities, and not upsettingly reversed if a variable exceeds an arbitrarily set target.

The full argument can therefore be implemented now, with models in their present state. Clearly the argument will be improved if the model is improved, but the method is not dependent on having a perfect model.

The proposed method also gives a coherent answer to the real problems raised in the Bank of England Quarterly Bulletin.

References

Bank of England Quarterly Bulletin, June 1977.

Gregory C. Chow, "Effective Use of Econometric Models in Macroeconomic Policy Formulation", Princeton Econometric Memorandum No.206, February 1977.

Ettie H. Butters & Gregory C. Chow, "Optimal Control of Non-Linear Systems Program Users Guide", Princeton Econometric Memorandum No.209, April 1977.

Gregory C. Chow & Sharon Megdal, "The Control of Large Scale Non-Linear Econometric Systems", Princeton Econometric Memorandum No.207, March 1977.

Jeremy Bray, "Optimal Control of a Noisy Economy", Jour. Roy. Stat. Soc. (A, General) 1975 (III).

J.J. Polak, "Monetary Analysis of Income Formation and Payments Problems", IMF Staff Papers, April 1957.

Free

Principal Private Secretary

cc PS/Chief Secretary
PS/Financial Secretary
PS/Minister of State
Sir Douglas Wass
Mr Airey
Mr Shepherd
Mr Bridgeman
Mr Isaac
Mrs Stamler

DR BRAY'S LETTERS OF 11 JULY AND 27 JULY AND THE CHANCELLOR'S LETTER OF 25 JULY

There was a wise doctor called Bray,
Whose theories led him to say,
That models were right,
Which proved day followed night;
Only fools might think night followed day.

I fear that we could be in for quite a long bout of correspondence with Dr Bray about monetarist and non-monetarist models. His letter of 27 July contains nothing very new - apart from the references in the last two paragraphs which return to familiar ground about his Finance Bill amendments requiring us to publish details of everything which might be described as a model. I doubt whether it would be wise to respond to these comments directly; previous correspondence has exhausted the possibilities of compromise.

2. On the main part of his letter, the Chancellor will not wish to get too deep into what are very technical matters. We could however have another go at corresponding with him directly at official level of the Ministers thought this would be helpful. I should perhaps add that we have agreed that the Bank should send quite a detailed reply to the accumulated letters which they have received from Dr Bray on the same subject.

3. There is however one point which the Chancellor might usefully make to re-assure Dr Bray that we do not believe control theory to be either irrelevant or unhelpful. We simply do not believe that it is possible to solve all the often conflicting aims of policy in a mechanistic way.

4. I attach a draft reply.



P E MIDDLETON
12 August 1977

DRAFT REPLY TO DR BRAY

Thank you for your letter of 27 July. I am of course the first to agree that we need as much insight as possible into "a noisy dynamic system like the economy". I know - I have to steer it! Moreover I accept much of what you say about the value of control theory. It can undoubtedly provide valuable insights. But equally I think it is wrong to exaggerate its value when we are so uncertain about how the economic system works and the weight to attach to different models of the behavioural relationships involved.

△We should however like to take up some of the points you raise in more detail, and I am asking my officials to get in touch with you direct about these⁷.

Flare

Mr Spencer

SECRET

cc Mr Shepherd
Mrs Stanler
Mr Wiggins

DR BRAY

You will see from the Chancellor's letter of 1 September to Dr Bray (which we have only just succeeded in prizing out of Private Office) that he took up the suggestion that we might try to get the correspondence with Dr Bray down to an official level. The correspondence with Mr Goodhart is a fair example of what we are in for, but I think I must now send some sort of letter to Dr Bray. I should like to base this on your draft note to Mr Wiggins of 18 July, and I should be grateful if you could put this into the form of a letter which I could send. Feel free to make it fairly technical if you wish.

PEM

P E MIDDLETON
16 September 1977

Enc



Treasury Chambers, Parliament Street, SW1P 3AG

01-233 3000

1 September 1977

Dear Sir,

Thank you for your letter of 27th July. I am of course the first to agree that we need as much insight as possible into "a noisy dynamic system like the economy". I know - I have to steer it! Moreover I accept much of what you say about the value of control theory. It can undoubtedly provide valuable insights. But equally I think it is wrong to exaggerate its value when we are so uncertain about how the economic system works and the weight to attach to different models of the behavioural relationships involved.

We should, however, like to take up some of the points you raise in more detail, and I am asking my officials to get in touch with you direct about these.

Denis Healey

(DENIS HEALEY)

Dr. Jeremy Bray, MP
House of Commons

212/19

Indicators of monetary stance

The most commonly used indicators of monetary stance are the behaviour of the monetary aggregates and interest rates. Since the beginning of this year these have given conflicting pictures of the tightness or laxity of monetary policy: on the one hand falls in interest rates, continued implicit negative rates when measured in real terms, and the lack of private sector demand for bank advances can be held to show that monetary policy is not constraining economic activity; on the other the low rates of growth of the monetary aggregates (low in comparison with the rate of inflation) suggest that monetary policy has been tight and is a constraint on economic activity and growth. This note first argues that interest rates are not an appropriate indicator of monetary stance for the UK and makes the case for the use of the wider definitions of the money supply as indicators of monetary stance. It then distinguishes between measuring monetary stance in terms of the growth rate of the monetary aggregates (which is what we tend to do) and in terms of variations over time in real money balances (which is what monetary theory would suggest). The difference between the two approaches can be appreciated under present conditions where even rapid monetary expansion for a period of a year or more would not restore real money balances to their level of a few years ago.

Interest rates as indicators of monetary stance

2. There are three ways in which interest rates are commonly used as indicators of the tightness of monetary policy: the level of nominal interest rates, regardless of the rate of inflation, can be considered in relation to 'normal' nominal interest rate levels - those prevailing on average in recent years; 'real' interest rates - nominal interest rates minus the current rate of inflation (or some other proxy for the expected rate of inflation) - can be held to be low when they are below, say, 3% and hence indicate that monetary policy is lax; rising nominal interest rates can be seen as an indication of tight monetary policy and falling interest rates as an indicator of lax monetary stance. It is obvious that any two of these indicators can be in flat contradiction with the third - and indeed many of the possible permutations of contradictions have been experienced within the past year. It would not however be valid to reject interest rates as indicators of monetary stance because of the ambiguities involved in their interpretation as the monetary aggregates can be criticised on similar grounds (see below for example).

3. Low nominal interests at present can be explained in several ways: they are low and falling because expectations about the future rate of inflation are that it will fall; or because there is little demand for loanable funds as a result of the present recession; or because balance of payments pressures have obliged the authorities to

reduce interest rates. Of these three theories only the second is necessarily associated with a relaxed monetary stance - and even then in the restricted sense that monetary policy is not at present acting as a constraint on activity. The first and last of the explanations are much more likely to be consistent with a tight monetary policy: inflationary expectations fall sharply as growth of the money supply is limited; or inflows are generated by low domestic credit expansion and the confidence associated with the prospect of continuing monetary restraint.

4. The most compelling reason for rejecting the behaviour of interest rates as the main indicator of monetary stance is their inter-relationship with exchange rate behaviour. If, for example under present circumstances the market should come to believe that sterling will depreciate to maintain our competitive position, short interest rates would rise immediately and long rates would follow, though to a more limited extent. It would be inappropriate to attribute this to a tightening of monetary stance.

5. This line of argument does not deny that interest rates are important in influencing economic activity - high nominal interest rates, even when inflation means they are negative in real terms, can cause cash flow problems for firms - and uncertainty about the future path of interest rates can deter firms from borrowing. It does however make it clear that they can not be the main indicator of monetary stance nor the main instrument of monetary policy.

The relationships between money and income

6. The theoretical literature on the ways in which the behaviour of the monetary aggregates, prices and economic activity are related is both vast and inconclusive. It is however only possible to define indicators of monetary stance, and to interpret them, in terms of a view of how those relationships work. The Treasury view - whether this is defined in terms of the Bridgeman Report or the financial forecasting and NII models - is that the behaviour of the monetary aggregates does have a great deal of influence on economic activity and on the price level (and that it may affect the price level directly as well as through the level of activity). But these effects occur through many different routes, with varying time lags; as a consequence the interpretation of the effects of monetary stance on prices and activity at any time must remain a matter for judgement rather than be encapsulated in one or two indicators measuring, say, the level of real money balances or the rate of growth of a given monetary aggregate. It is possible, for example, that the fact that real money balances have fallen sharply during the present recession may be as much its consequence as its cause.

7. There appear to be two sorts of way in which changes in the monetary aggregates

term, is expressed in the portfolio approach of the new quantity theory; in short-term however, there are direct relationships between monetary expansion, economic activity and external capital flows which are important because they give monetary policy a role to play in the day-to-day management of the economy.

8. The new quantity theory, propounded by Milton Friedman twenty years ago, argues that money has characteristics which differentiate it from other assets and which give it a central role in influencing activity in the short run and prices in the longer term. Money forms an important part of all individuals' and firms' portfolios. In equilibrium each person and firm will hold money balances which offer him a return equal, at the margin, to the return on other assets. Government can vary the money supply and so change asset portfolios. If Government increases the money supply, all other factors remaining the same, it obliges people to hold money balances greater than they wish to. People with excess money balances will spend them, and in doing so influence economic activity and prices. For example an unwilling holder of an excess money balance may seek to purchase a house; the additional demand exerts an upward pressure on existing house prices immediately, and stimulates further house building thereafter. Now is the end of the story - the vendor finds himself with excess money balances which he will seek to use to purchase assets, so influencing their prices, or consumer goods, so influencing the level of activity. This chain of events proceeds until changes in the price level and in the level of activity change the demand for money and bring it back into equality with the supply of money.

9. The chain of events described above depends on the existence of a stable demand for money - if individuals are content to let their money balances fluctuate then it will not occur. Econometric evidence does show that there is a stable demand for money as a function of nominal income over the medium term in the United Kingdom and consequently that the effect of changes in the money supply on prices and activity will be important.

10. The portfolio theory described above, where people attempt to equate their actual money holdings to what they would like to hold, does not provide the whole explanation of how money affects incomes and prices. In the short-run it seems likely that other mechanisms are important. An increase in the monetary aggregates, especially the wider ones, reflects injections into the expenditure stream and into purchases of financial assets. Increases in bank advances can finance investment, and consumption and so act directly on output; or finance purchases of foreign financial assets, and exert pressure on the exchange rate; or finance purchases of physical assets and so act on their prices (an example of this was the house price boom associated with rapid monetary expansion in 1973); or finance the purchase of private sector financial assets so reducing domestic interest rates and again financing investment. (An increase in

bank advances could also finance purchases of public sector debt but in doing so it would cause an offsetting reduction in the money supply.)

11. These are among the mechanisms identified by the Bridgeman Report. It can be argued that some of them are associated with changes in fiscal or exchange rate policy and that it is misleading to ascribe them to changes in the monetary aggregates. This sort of objection is misconceived: choosing a policy for monetary growth is likely to close options in fiscal or exchange rate policy - or looked at another way, there is no such thing as an increase in the money supply which does not have associated with it an immediate effect on the demand for physical or financial assets. The concern of the IMF with domestic credit expansion is based on this line of reasoning, and DCE targets are given on a quarterly and annual basis because the flow effects of monetary growth are as important in the short-term as the more general influence of changes in real money balances is over the longer term.

The monetary aggregates

12. For many monetarists the question "which monetary aggregate is the best indicator of monetary stance?" is not important because over a period greater than a year or two their growth rates tend to be very similar. This is illustrated in tables 1 and 2; the disparate annual growth rates of the different monetary aggregates contrast with the cumulated growth rates which are much more alike. Paragraphs 9-10 above argue that short-term fluctuations are important; and given that the wider definitions of the money supply more closely reflect increases in demand for assets and goods financed by increments in the money supply this suggests that the wider definitions of the money supply are more appropriate indicators of monetary stance. Though £M3 is generally accepted as the appropriate indicator of monetary stance the case for using the narrow definition of the money supply is still put forward on the one hand and a case can be made for using wider liquidity on the other. Each is considered separately below.

The narrow definition of the money supply - M1

13. M1 consists of notes and coin and current account bank deposits held by the public. In the United Kingdom little emphasis has been given to M1 in recent years but it is again being considered for two reasons:

i. it is thought to be easier to control M1 than to control wider monetary aggregates;

ii. other governments and monetary authorities place great emphasis on the

might welcome our doing so.

This approach is based on the proposition that M3 and M5 are too difficult to control for the reasons given below and so we should pay less attention to them and be content with controlling M1 - even if M1 is not the most important policy variable nor the best indicator of monetary stance. Holding M1 in check while wider measures of liquidity grow rapidly or irregularly will be held to be a sensible policy because it is something that others believe important and something the authorities think they can achieve even though they doubt its importance. Controlling M1 tightly thus becomes worthwhile mainly because it determines expectations about the economy, especially abroad, (and so helps foreign capital inflows) but possibly also at home.

The wide definition of the money supply - M3 and £M3

14. The wide definition of the money supply, M3, contains M1 plus all other private and public sector deposits with the banking system, including the foreign currency deposits of UK residents. Sterling M3, as the name suggests, excludes these foreign currency deposits. More emphasis has been put on £M3 since autumn 1976. A UK resident may only retain a foreign currency deposit for purposes approved by the exchange control authorities and a recent enquiry showed that some 75% of the foreign currency deposits within M3 represented either balances of oil companies and other firms needed to support their international operations or capital funds awaiting investment abroad. Changes in such deposits are more likely to reflect conditions in markets overseas than in the United Kingdom and attempts to limit their growth are likely only to encourage companies to hold their foreign currency deposits with banks overseas, which are necessarily excluded from measures of UK money supply and liquidity. The change in emphasis from M3 to £M3 was accompanied by a redefinition of DCE to exclude all bank lending in foreign currency to the private sector. The changes to both monetary statistics were thus consistent and reflected the view that, on balance, the effects of foreign currency loans and deposits of the private sector on domestic demand are probably relatively small, or at any rate different from the effects of sterling loans and deposits.

15. The main disadvantage with using £M3 as the most important monetary aggregate is that it is difficult to control within narrow limits in the short run - and doubly difficult when the control mechanism relies on controlling a reserve asset base. The difficulty of controlling £M3 may however have been overstated. The most recent period when it grew more rapidly than we would have wished was in the second and third quarters of 1976. Experience in 1976 (and in 1974) of the joint use of

special and supplementary special deposits (SSDs) suggests that we can slow the rate of growth of M3 and £M3 within weeks of taking action to do so. While it may be true that the use of SSDs introduces some minor distortions into monetary markets, accompanying measures to ensure a more rigid control over £M3 in the medium term will alleviate them.

Wider Liquidity - M5

16. This includes, in addition to M3, the other short term financial assets: Treasury bills, local authority short-term debt, building society deposits and national savings. Its use as an indicator of monetary stance is justifiable in similar terms to those for M3. A portfolio theory could take the view that wider liquidity best represents money for economic units because people are more concerned with the relationships between their illiquid and liquid assets rather than some subset of liquid assets such as M1 or M3. The rationale for this view would be, in large part, that interest rate fluctuations do not impose significant capital losses and gains on holders of these liquid assets, and this consideration will be sufficiently important to make portfolio holders treat liquid assets specially. The argument that the importance of fluctuations in M3 is associated with injections into the expenditure stream applies with still more force to M5. It might be thought that M5 would be still more difficult to control than M3. This is true in one sense - information on the elements in M5 not included in M3 is more difficult to collect and becomes available only with a lag and at quarterly intervals. Information on the narrower money aggregates will be available weekly in the near future and this should facilitate decisions about its control earlier than is at present possible. In another sense, however, M5 should be easier to control. M3 is subject to distortions: when a reserve asset squeeze is begun the banks change their liability positions to gain the funds they need. This shifts relative interest rates in favour of those financial instruments included in M3 and may result in a perverse growth in M3 in the face of a tightening monetary policy. M5 is less subject to these distortions: the switch between financial assets resulting from the reserve asset squeeze and its effect on interest rate differentials largely takes place within M5. In table 1 it is probably M5 which gives the best picture of what was happening to liquidity when M1 was growing slowly and M3 was growing extremely rapidly during 1972 and 1973.

Domestic credit expansions

17. DCE measures the growth of domestic credit; it is a flow concept unlike the three monetary aggregates described above; it can best be understood as an ex ante measure of money supply growth (that is it shows approximately how much the money supply would have grown by had the balance of payments been in balance). The way

in which DCE is defined makes £M3 the appropriate aggregate to relate it to, and DCE can conveniently be expressed as a growth rate by relating it to the level of £M3 at the beginning of a period.

18. There are two ways of looking at DCE, and the way we choose determines the interpretation of DCE as an indicator. Its advocates argue that a high level of DCE will be reflected in capital outflows and some upward pressure on the rate of growth of the monetary aggregates. Similarly a low level of DCE generates inflows and downward pressure on the aggregate. If however it is the growth rate of the monetary aggregates that influences economic activity, and if (as in fact appears to be the case) external flows are both volatile and influenced by other pressures than monetary policy, then DCE can be seen simply as the arithmetic consequence of monetary growth and balance of payments behaviour. These two extreme views of DCE could both be valid explanations of what occurs at different times. DCE can serve as a useful warning when monetary growth is moderate but balance of payments outflows are large but it does not follow that low DCE, when monetary growth is at the desired level, requires expansionary policies by the authorities, since such policies would probably tend to increase monetary growth as well as DCE.

Which monetary aggregate?

19. On balance it seems that there are mechanisms which make it important to take account of even relatively short-term fluctuations in the monetary aggregates. The question "which monetary aggregate?" is important because of their disparate behaviour. Since it is variations in £M3 and M5 which can be expected to have large short-term effects, we should choose them rather than M1 as indicators of monetary stance. Distortions in £M3 occur for the reasons given above, and it would be preferable to use M5. Given the lags in the availability of M5 this may mean putting more reliance than we would wish on £M3 . An examination of table 1 suggests why M1 is unsuitable: in 1972 and 1973 when liquidity undoubtedly was growing excessively rapidly M1 grew by 14 and 5 per cent respectively. Over the same period £M3 grew by 27 per cent in each year and M5 by 18 per cent. While there is a spread of 9 percentage points between the two measures and £M3 is undoubtedly distorted, they do give a better picture of what monetary stance was in the United Kingdom. DCE, while it does place emphasis on the short-term effects of monetary expansion, gives rise to problems of interpretation. If the authorities adopt a monetary growth target and a balance of payments target, it becomes otiose.

Levels or growth rates

20. The portfolio analysis referred to above views individuals as allocating their wealth among assets including money to equate their marginal rates of return. Such an approach argues that the appropriate indicator of monetary stance will be the level of money balances. There are two complications: do we mean nominal or real money balances? how can we take account of changes in wealth? Though the disruptive effect of inflation on economic activity and the resource costs of inflation are increasingly recognized the answer to the former question must be that we mean real money balances or, to put it another way, that we relate nominal money balances to nominal wealth when assessing the effect of changes in the money supply on portfolios. The need to take changes in wealth into account could raise all sorts of problems of data measurement and availability - these can be circumvented by assuming that wealth grows (and falls) at the same rate as national income. While the flaws in such an assumption are obvious and numerous its convenience more than offsets any disadvantages that ensue.

21. The use of a monetary aggregate, say $\text{\pounds}M3$, as an indicator of monetary stance, is then fairly simple. The equilibrium relationship between nominal income and $\text{\pounds}M3$ is defined either as the average over recent years (or as the value in a year when it is felt that the relationship was in equilibrium - if such a year can be found). Nominal income for the most recent quarter is used in conjunction with this equilibrium relationship to estimate the level of money balances. A comparison of these with actual money balances then gives an indication of monetary stance. This sort of measure has been used by academic monetarists, and has sometimes played a part in our assessment of the effects of monetary policy.

22. It is however more common for us to estimate the probable rate of inflation over the next twelve months and to argue in effect that monetary stance will be neutral if the $\text{\pounds}M3$ grows by that amount, tight if it grows by less, lax if more. If we begin from a position of equilibrium as defined in paragraph 21 then the two approaches are similar. They would be identical if neutral monetary stance was defined as a growth rate for the monetary aggregate equal to the expected rate of inflation plus expected growth in national income.

23. It would be possible to explain the emphasis we place on a target growth rate $\text{\pounds}M3$ as a simplification of a judgement about the desired level of money balances but our limited experience of monetary targets shows that a slower growth of $\text{\pounds}M3$ than the target level in one period does not bring forward demands for a more rapid growth in later periods. This behaviour has three sorts of explanation: the first is that we

do not know the equilibrium level of the ratio between money balances and income and that a pragmatic approach would suggest that we assume we are more or less in equilibrium at the beginning of every period we define a monetary target, so the market forces have a chance to move us towards that equilibrium; the second is that we have attached more weight in the recent past to controlling inflation than to controlling growth and have preferred to err on the side of caution in setting monetary targets; the third is that we attach great weight to the disruptive short-term effects of large increases in $\text{\pounds}M3$ even though, viewed in a longer perspective they are returning money-income relationships to a more normal level. It is possible that there is an element of each of these explanations in our attitude to monetary targets. It should however be noted that the second and third of them justify a tight monetary policy on (perfectly reasonable) short-term grounds and that it is only the first of them that would permit us to argue that monetary policy has not been tight because money markets have shown that a large increase in $\text{\pounds}M3$ than in fact occurred was unnecessary.

24. The table below shows the income velocity of $\text{\pounds}M3$ so far this decade. It fell sharply from its 1971 peak until 1974 but has now risen to a level above that peak. It is clear that in terms of the criterion set out in paragraph 21 - monetary stance measured in terms of levels - monetary policy has been tight for the past two years and is becoming increasingly so. It may be that this indicator understates the tightness of monetary stance because the number of institutions whose liabilities are included in $\text{\pounds}M3$ has increased in recent years and this tends to generate a trend reduction in measured income velocity. Under such circumstances our willingness to write off the under-achievement of past monetary targets expressed as growth rates may be an important factor in explaining the present constraints on output and prices.

The income velocity of $\text{\pounds}M3$ in the first quarter of:

1970	
1971	
1972	3.0
1973	2.8
1974	2.4
1975	2.7
1976	3.1
1977	3.3

Indicators of monetary stance over the next year or so.

25. It is possible to argue from the above table that growth in £M3 at a rate equal to the expected growth of nominal income over the next year or two would in itself constitute a restrictive monetary stance. Given that our forecasts of the rate of price increase are likely to be too low, given our past performance, this would make monetary policy extremely tight. This line of argument can be developed to suggest that monetary growth at a rate below say 15% over the banking year 1978/79 would be too tight - and such a rate itself only allows for 12-13% inflation and 2-3% real growth, and suggests that a 15-18% range would be more appropriate.

26. Such a range would be thought by most observers to be too high. This reflects their uncertainty about indicators of monetary stance cast in terms of levels or their preference for price stabilization rather than growth. It may also reflect their concern about the short-term effects of increases in the money supply. The fact remains that the Chancellor's target range for growth in £M3 of 9-13% for the banking year 1977-78 was seen as an important step in anti-inflation policy. As we claim that we are succeeding in reducing the level of inflation, even to announce the same target range for 1978-79 would appear to be a defeat to observers accustomed to thinking in terms of target rates of growth for the money supply.

27. When a target range for the increase in the money supply during the banking year 1977-78 was announced it was recognised that the degree of tightness of monetary policy this implied would be a function of the rate of inflation though this would be related to factors not necessarily influenced by monetary policy in the short term such as changes in commodity prices, the exchange rate and wage increases. This was considered appropriate: a target for monetary policy fixed in nominal terms would be more restrictive if inflation were higher - that is it would act as an automatic corrective to inflationary pressures. Such a target should not by itself be used as an indicator of monetary stance: the fact that the growth rate of the money supply is at the upper end of the target range does not mean that monetary stance is necessarily lax or even neutral. If inflation has been at a higher rate than was expected when the target was formulated keeping within a monetary guideline may involve a tight monetary policy.

Summary and Conclusions

- i. interest rates are not an appropriate indicator of monetary stance, partly because of the ambiguities inherent in their interpretation but mainly because of their close connection with the behaviour of the exchange rate.
- ii. of the four major monetary aggregates there is no clear cut case for selecting any one of them. On balance £M3 and wider liquidity can be expected to give a better picture of the financial constraints on real activity in the medium term. In the short run changes in £M3 and wider liquidity are likely to be associated with injections into the income stream and so have direct and immediate effects on activity and asset prices.
- iii. DCE is in effect a short-term monetary growth target which makes allowance for the effect of the balance of payments on the money supply. It does not, by itself, necessarily affect economic activity since a low level of DCE can be caused by foreign capital inflows rather than by restrictions on lending to domestic borrowers or on the growth of the money supply.
- iv. There are problems involved in casting monetary indicators (and monetary targets) in terms of growth rates for the monetary aggregates rather than in terms of levels. Real money balances are now at very low levels; should the rate of growth of the money supply continue at rates below the growth of nominal income this will mean that monetary policy is extremely tight.
- v. The purpose of this note is to define indicators of monetary stance. It seems that the one we already depend on should continue to serve: monetary stance is neutral if the growth rate of £M3 is equal to the growth rate of nominal national income. It is tight when lower, lax when higher. Underlying this definition is the view that monetary stance is neutral when it neither hinders nor stimulates real economic activity, and that money-income relationships are now in long-run equilibrium. Given that the income-velocity of £M3 is at an historically low level, this definition probably errs on the side of caution.

TABLE I

GROWTH RATES OF MONETARY AGGREGATES AND NOMINAL GDP¹ (PERCENT)

	M1	£M3	M5	DCE	GDP
1971	10	13	13	6	13
1972	14	27	18	34	13
1973	5	27	18	32	15
1974	11	10	9	22	15
1975	19	7	12	13	26
1976	11	9	12	20	16

1977 ²	na	9	na	9	

¹M1 is the narrow definition of the money supply; it consists of notes and coin in circulation with the public plus sterling sight deposits held by the private sector.

£M3 - "sterling M3" - is M1 plus all other sterling deposits (including time deposits) of UK residents in both the private and public sectors. There is a somewhat wider definition of M3 which also includes UK residents non-sterling deposits. £M3 includes sterling CDs. M3 was used as the measure of the money supply, widely defined, until 1976 when emphasis was given to £M3.

M5 - "wider liquidity" - is a wider measure of liquidity which includes short-term financial assets such as Treasury and Local Authority bills.

DCE - domestic credit expansion - is an adjusted money stock concept - it shows what the growth in M3 would have been if there had been no surplus or deficit in the balance of payments.

²Forecasts.

TABLE II

CUMULATIVE GROWTH RATES OF MONETARY AGGREGATES AND NOMINAL GDP BETWEEN 1970 AND THE YEAR SHOWN (PER CENT)¹

	M1	M3	M5	GDP
1971	10	13	13	13
1972	26	44	34	27
1973	33	82	58	47
1974	47	101	73	69
1975	74	114	94	114
1976	94	134	117	148

¹DCE is a flow concept and it would be inappropriate to cumulate its growth rate overtime.