# The Lags in Monetary Policy
# An Assessment of Alternative Approaches

Serious concern over lags in anti-cyclical policies is a more recent phenomenon. Fiscal and monetary policy discussions in the early post-Keynesian literature were largely conducted against a background of an *unlagged* system. The main interest of these writers was in assessing the size of the response in the implementation of variety of policy instruments and little attention was paid to the relationship between the timing of policy actions and the lag structure operative in particular economies. More recent writings have raised a number of questions bearing on the possibility that monetary-fiscal instruments may on account of these lags prove to be destabilising (1). This paper will be concerned with the lags in monetary policy alone and our objective will be to outline the variety of possible approaches to the lag problem.

## Simulation with an Estimated Econometric Model

One line of approach is to simulate the effects of monetary policy with the aid of a complete econometric model estimated for an economy. One essential requirement here is that the monetary sector should be represented in some detail. Many econometric models have ignored the monetary sector altogether, others have incorporated a monetary sector but provided no effective links between real and monetary variables, others again have provided links but the monetary sector is so weakly represented that it cannot do any real justice to the complexities of monetary policy.

One interesting and very important exception to this is a quarterly model of the U.S. economy recently estimated by Ta-

(1) Two of the earliest writings were those of Friedman [4] and Phillips [12].

Chung Liu (2). In this model the lagged value of the dependent variable is consistently used as one of the explanatory variables in the behavioural equations. This is important in our context because this device reflects the assumption of a distributed lag in which the influence of the independent variables decreases over time in geometric progression. There are two monetary variables affecting the real demand for goods: liquid asset holdings and a variety of interest rates. The monetary sector is made up of several equations, explaining a number of interest rates and a range of liquid asset holdings by different sectors. Two experiments carried out by Liu are relevant to us. In the one experiment he traces the effects of a maintained increase in the short term rate of interest (effectively controlled by the monetary authorities) on G.N.P. He finds that the maximum effect does not eventuate till *eight quarters* later. In another experiment he supposes that a given error in actual G.N.P. (excess or deficiency) is fully corrected by adjusting the interest rate *in the next quarter*. It turns out that this policy increases the severity of fluctuations and thus worsens the situation.

This approach would be very useful provided some reliance could be placed on the causal relations uncovered by the estimated equations. But in fact different econometric models have produced such a diversity of results that no single model can make any claim to finality. Moreover it is still open to the monetary expert to argue first that monetary institutions and financial variables are so subtle and complex that they cannot be incorporated within a manageable model (3), and second that behavioural relations in this area are themselves unstable and in a state of flux.

## Simulation with a Hypothetical Model

There are three requirements for this aproach:

(a) Define a dynamic model with at least one monetary instrument representing an "autonomous" policy variable;

(b) Make some assumption respecting the indicators to which the instrument will respond;

(2) See [12] Another exception is the model by Friend and Brown [6].

(3) For some excellent ilustrations of some of the difficulties involved see Friend and Brown *op. cit.*



(c) Indicate the criteria by which to decide whether the system has become more or less stable as a result of the implementation of the monetary instrument.

Phillips and Baumol (4) have adopted this approach in their examination of fiscal instruments. The basic technique they employed can be adapted for use in the case of monetary policy. We set out below one illustration of this technique.

(a) The following linear system of equations is postulated:

$$\begin{aligned} C_t &= cY_{t-1} \\ I_t &= v(Y_{t-1} - Y_{t-2}) - fR_{t-1} \\ Md_t &= aY_{t-1} - bR_{t-1} \\ M_t &= xCb_{t-1} + gY_{t-1} + hR_{t-1} \\ Y_t &= C_t + I_t \\ Md &= M \end{aligned}$$

C = consumption; I = investment; Y = aggregate income; R = "the" rate of interest; Md = demand for money; M = supply of money; Cb = "free" bank cash (the monetary instrument).

This system yields the following second-order difference equation (5):

$$[1] \qquad Yt = \left[c + v - \frac{f(a-g)}{b+h}\right] Y_{t-1} - vY_{t-2} + \frac{fx}{b+h} Cb_{t-1}$$

(b) Suppose there is a desired level of income (Ye). Phillips has suggested that three types of responses may be implemented by the authorities (6). First they may respond to the size of the error in a given earlier period (proportional control) e.g. $(Ye - Y_{t-1})$. Second they may respond to the total error accruing over a "given" past (integral control) e.g. $(Ye - Yt) + (Ye - Y_{t-1}) + (Ye - Y_{t-2})$. Third they may respond to the *change* in actual income (derivate control) e.g. $(Yt - Y_{t-1})$ (7). The second type of control is more

(4) See [12] and [1].

(5) The money supply function is of course unorthodox but it seems more realistic to allow the banking system to respond to both income movements and the rate of interest. Strictly these variables would operate only if Cb were above a certain minimum level.

(6) For a lucid account of the different types of responses see Day [3].

(7) This does not exhaust the possibilities. It would be possible to go even further and hypothesise some even more complicated formulae for control.

difficult to deal with so we will suppose that the authorities combine responses 1 and 3 only. One illustration of this assumed behaviour is:

$$[2] \qquad Cbt = k\ (Ye - Y_{t-1}) - l\ (Yt - Y_{t-1})$$

After substituting in [1] we obtain:

$$[3] \qquad Yt = \left[c + v - \frac{f(a-g)}{b+h} - \frac{l\,fx}{b+h}\right] Y_{t-1} - \left[v + \frac{fx(k-l)}{b+h}\right] Y_{t-2} + \frac{fxk}{b+h}\,Ye$$

(c) One criterion may be expressed in terms of the "rate of damping" in a free unconstrained system. The lower the rate of damping the more unstable we take the system to be. Suppose now the solution to both [1] and [3] produces cycles in the economy. We know that the "rate of damping" of these cycles is negatively related to the size of the $Y_{t-2}$ coefficient. Solution [3] after policy is implemented may now be compared with solution [1]. It is seen that the following results obtain:

$k = 1$ No change to system
$k > 1$ Policy adds to instability
$k < 1$ Policy adds to stability

Some comments on this approach are in order. In contrast to the first approach this one is more flexible in that it enables us to work with a variety of hypothetical models and perhaps even a wider range of instruments. In practice models need to be kept at a fairly simple level and policy responses assumed to be fairly elementary. More complicated systems and responses yield elaborate 3rd and 4th order difference (or differential) equations which are hard to interpret. Moreover this taxonomic approach, which involves experimenting with a large number of alternative systems, tends to yield the rather unhelpful result that, depending on the type of equation system postulated, the structural lags and the type and strength of response policy may or may not be stabilising.

Difficulties multiply when we begin to examine carefully the appropriate index of stability to be employed. It may be objected that the damping factor is important only in the "long run",



that "random shocks" may modify the significance of the results, that the frequency of cycles may also be relevant (8), that the endogenous quality of the system may be changed by the assumed policy reactions (e.g. from an oscillating to a non-oscillating system), that even where the rate of damping in a cyclical system falls the existence of ceilings and/or floors may make no effective difference to the amplitude of cycles. There is an even subtler objection: suppose the solution is one of real roots, both larger than 1, and suppose that the larger real root is raised; this raises the "explosiveness" of the system but it may be more relevant to observe the change in the lower root. Indeed it may be shown that if the lower root is lowered the system is likely to become more buoyant irrespective of the behaviour of the larger root (9).

## Estimating a Range of Structural Lags

Estimation may be casual or it may be empirical. Empirical estimation may be by means of interviews-questionnaires or by regression analysis. The starting point for any form of estimation is to set up a schema, relating particular events separated by a variety of possible lag patterns. One such schema is the following:

turning points → policy actions (10) → monetary variables → expenditure decisions (by sectors) → output distributions (by composition).

The basic question we are trying to answer is: how is the continuing behaviour of output modified by the presence of anti-cyclical policy actions? Assume turning points are "given". A switch in policy will occur some time after a turning point. The switch in policy will manifest itself in a range of policy actions maintained presumably until some time after the next turning point. These policy actions will after varying lags produce effects

(8) See Baumol [1] who also takes account of the frequency of cycles. As he shows, this criterion may well conflict at times with the "rate of damping" criterion.

(9) For the rationale of this and an empirical application of the idea to the Australian economy see Neville [11].

(10) No reference is made to the so-called recognition-action lag because this label effectively begs the question. It is conceivable that policy actions (see later) may have a direct effect on expenditure decisions e.g. when these actions have an announcement effect (as with the U.K. Bank rate.

on the monetary variables. These in turn will affect output and its composition over time.

The more important of the policy actions are: open market operations, changes in "controlled" rates, changes in liquidity ratios, directives. The three main monetary variables are: short-long rates, availability of credit (bank and non-bank) and capital values. The relevant output composition is: inventories, commercial construction, consumer durables, other consumption, capital equipment, residential construction, commercial construction, government expenditure: to each of these would correspond a different output distribution.

The complexity of the lag system may be appreciated by reference to the lag between the policy actions and the changes in the monetary variables. Several channels manifest themselves and it is clear that no single lag will describe the processes involved. The speed with which monetary variables will be influenced will depend both on the policy actions and the initial conditions of the economy (e.g. excess liquidity of the banking system).

The variety of lags isolated on the basis of this schema might be estimated empirically. The two best examples of this are the studies by Mayer and Kareken-Solow (K.S.) (11). Mayer's results obtained by use of survey-questionnaire techniques are shown in table 1 (12). By weighting the expenditures and making some assumption respecting the multiplier, Mayer was able to conclude that "monetary policy is too inflexible to reduce the fluctuation of industrial production by more than 5-10% *on the average*".

The K.S. study, using regression techniques, is less comprehensive. Only certain channels are examined in any detail and some of the results are conceded to be unreliable and ambiguous. The more interesting of the results are the following: in the post-accord years the average lag between turning points and the switch in policy is 8 months for an easy policy and 3 months for a tight policy. One channel investigated is that from free reserves to bank interest rates and from bank interest rates to inventory investment. The first lag proved most intractable. It appeared to be very slow

(11) See [10] and [9] Another example would be G. Horwich [7].

(12) In terms of our schema the lag recorded would be from monetary variables to output distribution. Mayer does also make references to our first two lags (although his formulation is different) but there is little serious attempt to measure these.



in operation but the reliability of the estimate was low. The second lag proved easier to estimate. It turned out that about 67% of the ultimate stimulation to inventory investment was realised within 12 months. The other channel studied was even more promising. This was concerned with the lag from the long rate (industrial bond yields) to new orders and from new orders to the output of capital. They found that about 90% of the total effects on new orders of a change in the rate was felt within 12 months (75% after 6 months) but only 50% of the effects of new orders on the output of capital goods was felt within 12 months. K-S's conclusion, which agrees with Mayer's, was that "plant and equipment investment, while probably ultimately responsive to monetary policy, changes too slowly to be of any use for countercyclical policy of the post-war variety" (13).

TABLE 1

SOME RESULTS (T. Mayer) DIRECT EFFECTS (excluding multipliers) CHANGES IN AVAILABILITY OF CREDIT TO OUTPUT CHANGES (average lags in months)

| | Changes in credit to start of output | | Time pattern in construction |
|---|---|---|---|
| | Easy Policy | Tight Policy | |
| Residential Construction (new and maint. - repair) | 5 | 3 | ab. 85% in first 4 mths. |
| Industrial plant and equipment | 6 | 4 | 28% 4 mths.<br>63% 7 mths.<br>80% 12 mths. |
| Private non-residential building construction | 8 | 5 | 47% 4 mths.<br>79% 7 mths.<br>100% 12 mths. |
| Agricultural investment . . . | 1 | 0 | 100% 3 mths. |
| Consumer credit . . . . . | 2 | 1 | — |
| Inventories . . . . . | 1 | 1 | 100% 2 mths. |

One important inference to be derived from these studies is that the lag appropriate to the long rate may be too long for

(13) *Op. cit.*, p. 6. Kareken-Solow's results are difficult to compare with Mayer's but it does appear that where they overlap (as in inventories and capital equipment) Mayer's lags are significantly less than those of K.S. However see White [14] for the criticism that Mayer's lags are too long.

stabilisation purposes (14). This raises the question of whether perhaps monetary policy ought not to confine itself, for short term stabilisation, to changes at the short end whilst maintaining long rates fairly stable over the cycle (15). This idea that long rates might be maintained fairly stable over the cycle was in fact supported by the Radcliffe Report, although the reasons it advanced for this were rather different from ours (16). The Report suggested two reasons for such a policy: the first was that these variations would have a serious impact on the liquidity of the financial institutions and this was undesirable; and the second was that in conditions of recession such a policy would require feeding considerable liquidity into the economy which would tend to create difficulties in the following boom. Kaldor, in his memorandum to the Radcliffe Committee (17), in effect put forward another reason for keeping long rates reasonably stable: he pointed out that the greater the fluctuation in the long rate the greater the risk in holding bonds and the higher the average rate required over the cycle. This higher rate might discourage growth.

A sound theoretical case may be made, then, for restrained flexibility at the long end of the market. This would pose no problems in practice provided (a) the structure of rates may be manipulated by the authorities in this way, (b) short rates and short lending are effective in some degree, and (c) fluctuations at the short end do not impinge significantly on expenditures which have a long lag. If any one of these three conditions does not hold then monetary policy must either be abandoned for short run stabilisation or run the risk of adding to instability.

The third approach under discussion is subject to many difficulties. Only some of these will be touched on. One problem is that there may be significant differences in the operation of tight and easy money policies: it may be that in periods of full employment tight money policies may not reduce effective demand but simply reduce the inflationary gap. This means that the deflationary effects of a tight policy cannot be assumed to be carried over into

(14) The capital-value effect of the long rate on consumption (if any) may, however be quite short.

(15) For a similar deduction see Phillips [12].

(16) See especially paragraphs 488-491 · [14].

(17) See [8].



the later stages of the downturn (18). Again if we were to assume, on plausible grounds, that a tight policy is more effective than an easy policy then there may also be little carry-over into the boom of the effects of an easy policy (19). These two points would tend to strengthen the stabilising effects of monetary action.

This conclusion may be further reinforced by a number of possibilities: that "existing" projects carried over from an easy policy may be slowed down or postponed during a tight policy; that projects discouraged by a tight policy may be taken up again in the earlier stages of the recession. A tight policy may also merely *put forward* the expenditure decision as distinct from cancelling or postponing it: if the rate of new loan approvals falls off this may mean relying on other sources of finance which may take some time to negotiate. This in itself is significant because it may mean that more of the carry-over of expenditure effects will be felt in the downturn than otherwise. Again, turning points may not be independent of policy actions. If particular turning points, e.g. from the trough, were "brought about" by policy actions and if in the absence of these actions the economy might have stagnated for some time in a recession, then the stabilising effects of policy might be greater than would appear from an examination of statistics on *actual* turning points.

Another problem is that the imputation of particular changes to specific policy actions may be hard if policy actions operate in a non-linear fashion. One example of this would be where the effects of liquidity changes are different, depending on the level of excess reserves. A final point concerns the methodology of this approach. Since we are concerned with contrasting the course of income with and without policy some difficult questions respecting the dynamic properties of the system arise. Mayer effectively dismisses these difficulties by abstracting from the accelerator and thus implicitly assuming an endogenous system which is at the same time non-oscillating and stable. In practice no other assumption is feasible within the context of this approach but it is worth bearing in mind that more realistic assumptions respecting the

(18) See on this White [16].

(19) One lag, however, may conceivably be very long. In countries where overdraft limits (approvals) are granted by the banking system the accumulation of unexercised approvals in a recession may not manifest itself in increased expenditures till the boom is well under way.

dynamic behaviour of the system does mean that extremely complicated reaction patterns to policy actions may manifest themselves in subsequent periods.

## Leads and Lags in Money and Economic Activity

Friedman (20) has put forward theoretical reasons for believing that the lag in monetary policy may be both long and variable. We have already suggested evidence to support both these propositions. Friedman, however has tried to defend his argument by making comparisons of peaks and troughs in *the rate of change* in the money supply series with peaks and troughs in business. He finds in fact that the lead of the money series over business [National Bureau reference cycles] has tended on the average to be long and also variable. But commentators (21) have been quick to point out that there are a number of overwhelming objections to this procedure: the fact of a lead can hardly prove causality; moreover, it is hardly appropriate to compare the *rate of change* in the money supply with the level of business. Indeed, if, instead, quarterly first differences in the money supply are compared with first differences in production or G.N.P., the lag virtually disappears, as K.S. have shown (22).

## Conclusions

We have examined four different approaches to the study of lags in monetary policy. The fact that cycles vary in length and that the lag itself (principally the 2nd in our schema) is variable means that no *general* conclusion is possible. The first approach has limited usefulness because the equations estimated may not be very reliable and because the monetary relations postulated are too crude and primitive. The second approach extends the range of flexibility and enables us to experiment with alternative lag patterns and policy responses, but the taxonomic technique may be cumbersome to handle and in practice yields indeterminate results. The

(20) See in particular [5].
(21) See Kareken-Solow, *op. cit.* and Culbertson [2].
(22) Kareken-Solow *op. cit.*



third approach is very important. Estimation of these structural lags has proved extremely difficult and even after estimation is completed the problems of weighting remain. Again, simple multiplier sequences need to be assumed in estimating longer run effects, and more complicated reaction patterns, such as those implied in accelerator responses, are abstracted from. One advantage the first and second approaches have over the third is that these more complicated responses are incorporated in the model. The final approach of Friedman's was rejected as the least useful.

If we take seriously the empirical work actually carried out to date in this area, in particular the writings of Liu, Mayer and K.S. we are forced to conclude that monetary policy may well prove destablising in its operation, and there is therefore a strong case either for reforming its operations or abandoning it.

*Sydney.* V. Argy

BIBLIOGRAPHY


1. W. Baumol: Pitfalls in contra-cyclical policies - some tools and results, *Review of Econs & Stats*, February 1961.
2. J. M. Culbertson: Friedman on the lag in effect of monetary policy, *Journal of Pol. Econ.*, December 1060, 1961.
3. A. C. L. Day: *Outline of Monetary Economics*, Oxford, 1957, chp. 26.
4. M. Friedman: The effects of a full employment policy on economic stabilisation in *Essays in Positive Economics*, Chicago, 1953.
5. Friedman: The lag in monetary policy, *Journal of Political Economy*, 1961.
6. I. Friend and M. Brown in Private Capital Markets - Research Studies for U.S. Commission on Money and Credit (Prentice Hall) esp. Technical Appendix.
7. G. Horwich: Elements of Timing and Response in the balance sheet of banking, *Journal of Finance* (53-55) May 1957.
8. N. Kaldor: Memorandum - (Evidence) submitted to the Radcliffe Committee.
9. J. Kareken and R. Solow: Lags in Monetary Policy in Stabilisation Policies - Research Studies for U.S. Commission on Money and Credit (Prentice Hall).
10. T. Mayer: The Inflexibility of Monetary Policy, *Review of Econs and Stats.* November 1958, May 1963, August 1964.
11. J. Neville: A simple econometric model of the Australian economy - *Australian Economic Papers*, September 1962.
12. A. W. Phillips: Stabilisation policy in a closed economy - *Economic Journal*, June 1964.
13. A. W. Phillips: Employment, Inflation and Growth - *Economica*, February 1962.
14. The Radcliffe Report - Committee on the working of the monetary system - 1959.
15. Ta-Chung Liu: An exploratory quarterly econometric model of effective demand in the post-war U.S. economy - *Econometrica*, July 1963.
16. W. H. White: The inflexibility of anti-cyclical monetary policy - *Rev. of Econs and Stats*, May 1961, August 1964.