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Terry
Don't know if you've seen this.
Ch's comment re pp 14-15 was
"This man is a lunatic" !

Alan

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Macroeconomic Policy after Monetarism

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Introduction

Macroeconomic policy in advanced Western countries is now in a state of profound crisis. It is not just that policies have recently become more unsatisfactory, or that we are living through the worst period of unemployment since the 1930s. Both of these things are true. But the problem lies deeper, at the level of ideas. Policy-makers are adrift, without a framework to guide them, in a way which has not been true since the 1930s. Gone is the confidence which characterised policy-making in the Keynesian heyday of the 1950s and 1960s. Gone, too, is the promise which monetarism offered in the 1970s of providing a new framework for policy. It is not enough simply to muddle through, applying commonsense to the making of policy. As Keynes once remarked, commonsense is merely outdated theory: in applying commonsense to economic policy-making we are all 'the slaves to some defunct economist'. What is needed is a new framework for policy. It is not yet fully available. But this article is about how such a framework can be built.

As we shall see, discussion about the framework for policy operates at two distinct levels. At one, higher, level there are discussions about the kind of policy which a government ought to pursue. These discussions concern the overall objectives for policy, and the instruments which the government should have at its disposal in order to achieve these objectives. Discussions at this level touch closely upon politics, upon ethics and upon what the commentators believe to be desirable for the society at large. (Or, more sub-consciously, upon what they believe to be in their own self-interest.) An example of discussion at this level concerns the debate between Keynesians and monetarists, which we shall encounter below. At another, lower, level there are discussions about technical details of the government's chosen kind of policy and how these can be refined and improved upon. For example there are debates about whether instruments for policy should be assigned to particular objectives of policy, and investigations of how the chosen types of policies can be prevented from actually amplifying economic fluctuations! As we proceed, it will become apparent that it is not always easy to disentangle these two different levels of discussion.

This article is organised as follows. The first two sections discuss Keynesianism and monetarism in their turn, in an endeavour to distinguish the enduring lessons which should be learned from both of these systems of thought. In the middle section, I discuss how these lessons can be applied to

* I am grateful to Grant Baird, John Foster, Fred Gruen, James Meade and Tom Wilson for very helpful comments.

create a new framework, and discuss some research which I and a number of colleagues have been engaged upon to this end. The final section brings together some remarks about technical issues. Although these concern the lower level of discourse, they are not without interest.

The Golden Era of Keynesian Policies

Keynesian macroeconomic policies evolved from the analysis in Keynes's *General Theory*, and involved a commitment by many Western governments during and after the Second World War to use policy to pursue high and stable employment. An example is the Full Employment White Paper of the United Kingdom. Similar policy commitments were published for example in Australia and the United States. As well as full employment, governments came to assume responsibility for the objectives of economic growth and for the balance of payments. All of these objectives were to be pursued using the interrelated instruments of financial policy: fiscal policy, interest rate policy, exchange rate policy, and with agreement about the use of the instruments of international commercial policy (tariffs, quotas, import restrictions and licences, etc). The period during which these policies were pursued, roughly from 1945 until 1970, involved the greatest expansion in economic activity that the Western world has ever known. Opinions differ as to how directly responsible Keynesian policies were for their success, but most agree that the Keynesian policies were important, at least indirectly, in creating an environment in which this expansion could take place.

Two technical aspects of the design of these policies quickly became important. Initially it was thought that the policy instruments could be assigned as follows: fiscal policy to full employment, monetary policy (through the setting of a low interest rate) to economic growth, and exchange rate policy and commercial policy to the balance of payments. It was, as it were, the responsibility of domestic Treasuries to ensure high and stable employment, the responsibility of the domestic monetary and financial system to ensure that sufficient resources were devoted to investment, and the responsibility of the IMF and the General Agreement on Tariffs and Trade (GATT) to ensure that international conditions were compatible with balance of payments equilibrium. But numerous observers (Tinbergen, Meade, 1951), (Swan, 1960) and others, pointed out that difficulties could arise if all the interrelationships between objectives and instruments were not considered in the setting of policy, in that the pursuit of one objective could drive another objective off target. An example is the balance of payments difficulties which resulted from the pursuit of full employment in the United Kingdom and which led to a 'stop-go' conduct of fiscal policy: expansion to promote employment followed by emergency contraction to protect the balance of payments. Furthermore, it was recognised that without care policy could actually magnify economic fluctuations. Even, for example, the simple case of

the fiscal expansion embarked upon to deal with unemployment might be carried out with such a lag that it coincided with the economy's in-built recovery, causing thereby an excessive boom and excessive employment growth. Milton Friedman was on to this point very early (Friedman, 1953). It was also made by the ex-control engineer, Bill Phillips (1954, 1957), who was familiar with industrial and electrical applications of control engineering, in which feedback control can be destabilising if not applied with care. The need to design Keynesian policies so as to avoid these two difficulties led to the use of econometric models in policy-making.

The fundamental problem with Keynesian stabilisation policies—much more important than the above two technical difficulties—is that they are unable to deal with the problem of inflation. This is because the commitment to full employment contained within Keynesian policies removes any threat of unemployment resulting from high wage settlements, and it is upon this threat that wage stability in part depends. Keynesian economists recognised this difficulty (Kalecki, 1944) but had no clear remedy. Reliance on centralised incomes policy (compulsory or voluntary) has—in many countries, including Britain—proved unequal to the task. Incomes policies face appalling administrative difficulties. There are the problems of exemptions; the need to attract labour for particular purposes by offering higher pay; and so on. All of us are familiar with these problems. But more fundamentally, incomes policies face a prisoner's dilemma. Given the government's commitment to full employment, it is in the interests of each individual group of wage setters to break the incomes policy themselves whilst relying upon other groups to adhere to it. In the jargon of modern American economics, incomes policies are not 'incentive compatible'.[1]

1. The term prisoner's dilemma arises from the description of the following problem. Imagine two prisoners being held separately in solitary confinement each accused of murder. They are offered the following alternatives. First, if they provide evidence which incriminates the other prisoner, but they are not themself incriminated, they will get off free. Second, if there is no evidence incriminating them, but they refuse to talk and provide no evidence themselves, they will get five years imprisonment for burglary. Third, if there is evidence to convict them of the murder, then they will hang. On deciding his response, the first prisoner faces two alternatives. Either the other prisoner has told upon him, and so it doesn't matter what he says, because he will hang anyway. Or the other prisoner has been altruistic and not told upon him. In this case it is in his interests to tell upon the other prisoner in order to avoid the five years of imprisonment for burglary. Thus the first prisoner can do at least as well by incriminating the other prisoner whatever the other prisoner has done. By a repetition of this argument, the other prisoner can do at least as well by incriminating the first prisoner. Thus each prisoner incriminates the other, and both prisoners hang.

Modern research into game theory suggests that it might be possible to avoid such a difficult outcome by playing the game repeatedly (!) so that in effect prisoners come to learn that it is in their own interest to behave altruistically and come not to renege on altruistic behaviour. But the temptation to renege will always remain strong. The analogy for incomes policy and the repeated games idea is that both may come to realise how much better off they would be if they had stuck to the incomes policy and thus the incomes policy could be sustained. The experience of the Labour government in the late 1970s does not lead one to hope very much from this line of argument.

The Monetarist Counter-Revolution

More conservative economists like Hayek used this fundamental difficulty of Keynesian policies as a basis on which to build an entire monetarist counter-revolution. Friedman set forth this counter-revolution in his Presidential Address to the American Economic Association in 1968. He argued, first, that instead of the pursuit of full employment, macroeconomic policy ought to be devoted to stabilising the growth of money incomes, and second that this policy ought to be carried out by monetary means. His third claim was that these monetary means ought to involve the pursuit of a constant rate of growth of the money supply.

The first of Friedman's proposals was a natural response to the fundamental difficulty of the Keynesian position. By stabilising the growth of money incomes, macroeconomic policy replaces a commitment to full employment with a commitment that inflation will not be passively accommodated. It does, it is true, leave the private sector free to determine the split in money incomes between low prices and high employment or high prices and low employment, but it ensures that inflation, or accelerating inflation, will be met by contractionary policies, thereby creating a threat of potential unemployment which helps to ensure wage stability. It helps partly to solve the prisoner's dilemma problem described above. It does this because the negative externality (high inflation) which one group of wage settlers imposes upon the other is partly now internalised (this first group now faces the present threat of unemployment).

Many who are not monetarists now support this proposal of Friedman's for stabilising the rate of growth of money incomes (Meade, 1982, Tobin, 1980). I count myself amongst these supporters too.

But the optimism engendered by Friedman that inflation can be controlled by stabilising the growth of money incomes, without generating any difficulties of high unemployment—has proved completely unfounded. The 'rational expectations monetarists' who followed him, appear to have been misguided in their belief that wage-setters would understand the implications of the anti-inflation policy and revise their claims downward accordingly. Not only may it take years of high unemployment to reduce inflation, but it also seems that permanently high levels of unemployment are required to keep inflation stable. This is because wages and prices are set, not in the flexible price markets of economics textbooks or of the Chicago wheat market, but by strong unions and by monopolistic firms. As a result, inflationary pressures have a momentum of their own, which, without other measures, may require a high degree of market slack to discipline.[2] Thus Meade, for example, argues

2. Those in the Marxist tradition will not be surprised by this 'discovery' of the 1980s. Thus Thomas Balogh (1982) writes: 'Monetarism is the incomes policy of Karl Marx. By deliberately setting out to base the viability of the capitalism system on the maintenance of a large "industrial reserve army", monetarists validate Marx's analysis' (pp 177–8).

that the stabilisation of money incomes has to be combined with a large number of measures—profit sharing, arbitration of pay settlements, a wage inflation tax, employment subsidies—to exert further downward influence on wage costs, so as to ensure a high level of output and a low level of prices consistent with a particular level of money income. We will meet these ideas again.

The second of Friedman's proposals is about the assigning of instruments to objectives. It has, in the judgement of many, been responsible for a second set of difficulties. The control of money income growth by the instrument of a tight monetary policy makes the burden of the control of inflation fall mainly on investment rather than on consumption, since it is primarily investment which is reduced in the face of tight monetary conditions and high interest rates. This makes it very difficult for economies to add to their productive potential as a way of meeting inflationary pressure. Since inflation to a large extent arises because of claims for income in excess of what is available in the society, a way of dealing with it is to invest and modernise industry, to make it capable of producing an amount which will more nearly satisfy the aspirations of the population. But the policy of tight money makes this very difficult. And it stores up problems for later, by sustaining the consumption of the present at the expense of the well-being of the future.[3] Furthermore in an open economy high interest rates also cause an excessive appreciation of the exchange rate. This is because, now that international capital markets are very integrated, the effect of tight monetary policy falls first upon the financial markets, and only with a lag causes wages and prices to fall. And tight financial markets induce inflows of capital from abroad which drive up the exchange rate. This led directly to the over-valuation of both sterling and the dollar in the 1980s. And it has seriously affected the international monetary system. John Williamson, of the influential Institute for International Economics in Washington, DC, has described how it has made moves towards international monetary reform very difficult. Furthermore, it has also damaged manufacturing industries in the United Kingdom and the United States which participate in international trade, leading to the phenomenon of deindustrialisation. And in the US it has so damaged much of US industry as to lead to protectionist pressures which, for a time in 1985, threatened to engulf the entire international trading system as well, and destroy the GATT (whose importance in the post-war world has already been mentioned). A better outcome could be achieved if monetary policy were not assigned alone to the control of money income growth, but if instead the instruments of fiscal and monetary policy were used together, in balance, to control money income growth.

3. This is why many people are so worried about the longer run effects of the Thatcher policy in Britain, in particular the use of oil revenue during the early 1980s to sustain the real income of those at work whilst the productive potential of the British economy staggered and fell.

Finally, Friedman's third proposal (a constant rate of growth in the money supply) also appears to be thoroughly misguided. It ignores the practical difficulties of controlling the money supply, which are more difficult in countries like Britain than in the United States. More importantly, it ignores the fluctuations, frequently wild, in the demand for money which would disturb the level of money incomes in an economy with a fixed money supply (Poole, 1970). It is these fluctuations which have given monetarism such a bad name over the past few years in Britain. But most fundamentally, Friedman's third proposal relies too heavily on the supposed ability of the private sector economy to dampen economic fluctuations automatically.

This self-stabilising ability of the private sector is supposed to work as follows. If real expenditures were to fall, so that the growth of money incomes were to fall, wages and prices would fall, so that the growth in the demand for money would fall and interest rates would fall. Lower interest rates would then stimulate expenditures, and this would rekindle the growth of money incomes as required. If *per contra*, real expenditures rose, then the reverse process would be supposed to operate. And hence the growth of money incomes would be kept on track.

Now it is an enduring contribution of Keynesian economics to have shown that the ability of the private sector to stabilise fluctuations in this way is entirely problematic. Chapter 19 of Keynes' *General Theory* was entirely devoted to this. As wages and prices fall, expectations of a further fall may lead to consumers and investors further postponing their expenditures, in the hope of buying goods more cheaply in the future, and expenditures will then fall still further rather than recover.[4] In this may lie one of the reasons for the failure of Western economies, so far, to respond as expected to the collapse in oil prices in early 1986.

Herein lies an irony. As noted above, Friedman argued that Keynesian policies were likely to magnify economic fluctuations, reinforcing a boom or magnifying a slump when these happened. But if Friedman's proposal for a fixed rate of growth of the money supply were adopted then this might have a similar destabilising effect. It is thus my view that even if Friedman's first two proposals were to be accepted—and I argued against them—then monetary policy would still need to be actively manipulated so as to ensure the dampening of economic fluctuations in the economy. It becomes just as important for monetarists as for anyone else to design stable, active policies.

There is a famous 'proof', due to Sargent and Wallace, that any such active monetary policy would, if it was fully understood, be *entirely* ineffective. But that demonstration rests on the assumption that the private sector's supposed

4. Tobin (1975) in an excellent paper, which is not well known, gives a formal proof of how this can become unstable.

automatic stabilising mechanism for dampening fluctuations is *instantaneous* which is literally incredible. The idea runs as follows. Suppose that the government announces that when there is unemployment, it will increase the rate of growth of the money supply, in order to lower interest rates and ease monetary conditions so as to stimulate expenditure and reduce unemployment. Suppose too that the private sector knows this rule. Suppose further that any increase in the money supply must eventually lead to inflation. Then when unemployment occurs the government increases the money supply. But agents in the private sector know that this will happen, know that prices and costs will rise, and so know that it would be foolish to increase their output unless they also put up prices. And so everybody puts up prices instantly, prices rise at the same time as the money supply increases, so monetary conditions are not actually eased, so interest rates do not fall, so expenditure is not stimulated, and so the government has not done anything at all to improve the unemployment position—it has simply raised the price level! It is the instantaneous way in which this process is supposed to work which makes it so very peculiar. (See Maddock and Carter, 1982, for a very clear exposition and criticism of this Sargent and Wallace idea.) That anybody could ever have been fooled by this 'proof' is bizarre.

And thus we can conclude that there are at least three things wrong with monetarism—things wrong, in fact, with each of Friedman's three key proposals. First, it is not good enough simply to abandon the pursuit of full employment and instead to merely seek to stabilise the growth of money incomes. Second, stabilising money income growth by monetary means alone should be avoided. Third, doing this by attempting to pursue a constant rate of growth of the money supply appears to be a mistake.

A New Framework for Macroeconomic Policy

What lessons can we learn from Keynesian and monetarist thought as summarised above?

A new policy-making framework would need to draw the lesson from the monetarist counter-revolution that macroeconomic policy cannot give a commitment to full employment independently of inflationary developments. This is what was wrong with Keynesian economics. But it will have to recognise the three difficulties facing monetarism. It will have to recognise that employment-creating measures at the micro-level in the labour market like those proposed by Meade are essential if less expansionary policies are not to cause unemployment. It will have to utilise fiscal and monetary policies together in harmony so that a combination of tight monetary policy and loose fiscal policy does not damage investment and cause an over-appreciation of the exchange rate in the way which we have described. And finally, this macroeconomic policy will have to be an active policy, and it

will need to be carefully designed technically so as to avoid instabilities. We take up each of these four issues in turn.

1. A Target for the Growth of Money Incomes

There needs to be a policy for maintaining a low rate of inflation.

Like Friedman, we must recognise that there is a need for a macroeconomic policy which avoids a commitment to full employment independently of what is happening to inflation. This, as we have already said, is necessary in order to exert a discipline over wage setting, which makes it harder for each group of wage setters to pursue their own wage increases at the expense of others, offering the threat of unemployment if wage increases get out of hand. The threat of future unemployment acts as a 'deterrent' against high wage settlements in the present (and so helps to solve the prisoner's dilemma problem of wage fixing described above). Like all good deterrents this threat is best made public but not used: its effect on actual wage settlements now need not be through *actual* unemployment now.

Such a policy is also important for the foreign exchange market. In that market the exchange rate will depend upon what people think future inflation is going to be, which will in turn depend upon what people think about policy. A policy which is thought to underwrite whatever inflation emerges in the pursuit of full employment will be attacked, and probably defeated, on the foreign exchange markets.

Australian experience is interesting here. For eighteen months after April 1983 the new Labour government was the wonder of the Western world, pursuing an expansionary policy to cure unemployment at the same time as it had an orthodox incomes policy against inflation. One day in February 1985, the foreign exchange markets decided that although the full employment policy was credible, the incomes policy was not. The currency lost 20 per cent of its value in a fortnight. (This happened before the further collapse of the currency by another 20 per cent in 1986, the reasons for which were also to do with the collapse of primary commodity prices.) At the time of the first collapse there was no clear monetary policy, simply 'eclectic commonsense'—so very different from the monetary policy in Britain at the very same time which was clearly committed to preventing inflation and preventing any collapse of sterling which would lead to inflation. The run on the pound in the previous month was spectacularly reversed, in a way which the Australian one never has been.

We have already argued that, since the anti-inflation stance of policy cannot be sustained by an orthodox incomes policy alone, it is desirable to have a target for the rate of growth of money incomes.

Some observers in the UK believe that the policy against inflation could instead take the form of joining the European Monetary System (EMS) by

signifying unequivocally government's commitment to respond quickly and effectively to a deterioration in the exchange rate. But joining the EMS will not control inflation on its own. If we fix the exchange rate this will indeed prevent imported inflation (since EEC inflation is at present expected to fall) but domestic inflation could always drive us off course and *force* a depreciation unless we have some other credible domestic policy towards inflation.

We have already argued that monetary targets are not such a credible domestic anti-inflation policy.[5] This still leaves us with our anti-inflation policy of controlling the rate of growth of money incomes, the details of which are discussed below.

It is not, however, enough to do what the present UK government appears to do, and to have *only* an anti-inflation policy. There also needs to be *some* policy of maintaining a high level of output (and of moderating slumps). The self-stabilising property of the economy is not strong enough to deal with slumps or with excessive increases in expenditures. The degree of range in price flexibility in a modern economy will not be sufficient for this to be automatic. Policy ought to involve some commitment which would prevent these fluctuations *to some degree*.

There needs to be a trade-off between the outcomes sought for these two objectives of low inflation and high output. Policy cannot involve a commitment to a particular level of output independently of inflation, otherwise the deterrent effect referred to above will be removed. But equally policy cannot simply be directed at inflation irrespective of the level of output, for otherwise slumps may become self-perpetuating. A trade-off would display the relative weights attached to these two policies. A target for money incomes is a particular way of expressing this trade-off. It gives changes in output and changes in prices equal weights in calling forth a policy response.

It might be thought better not to have a money income target but to have a policy which looked separately at what was going on for output, and at what was going on for inflation. An optimum policy might respond to shocks which alter money GDP in rather different ways depending upon whether, say, the shock was a shock to output or a shock to wages. The trouble with that is that it may well lead the policy back to the stating of explicit output targets. All the difficulties of Keynesian policy-making would then re-emerge.

What does this means in the present context of the UK? It should be announced as a target of policy that money incomes should grow at a steady rate, at a rate somewhat faster than money incomes are growing at present. This would be a reflationary policy, promoting recovery from the present recession. But it would contain within it an automatic commitment that the reflation of output and employment would be reduced by any rise in the rate

5. See the discussion above of Friedman's third proposal.

of price inflation, and vice versa. Policy could thus promote employment growth and recovery from the present appallingly high levels of unemployment, but at the same time anti-inflation policy would remain credible.

The money income target contains an essential simplicity which will be important in retaining the deterrent effect of policy against inflation. It leaves the private sector free to determine the split in money incomes between low prices and high employment or vice versa. But it ensures that inflation, or accelerating inflation, will be met by automatic restraints of output and employment thereby incurring the deterrent effect. It does this in a profoundly simple way by saying that the growth of money incomes and money expenditures and the money value of production will be kept in the economy on a steadily rising path.

Both the labour market and the foreign exchange markets need such a guarantee from financial policy, if any reflation policy is not to become an orgy of price inflation. The ghost of the Medium-Term Financial Strategy must be kept alive in some way. This idea will be, I think, the lasting legacy of Thatcherism in this country. Technically flawed though that strategy has been in its actual form, the existence of some such strategy is needed to give guidance. The design of the 'son of MTFS' is discussed below.

2. Measures to Promote Employment

Within the framework provided by a target for the growth of money income, measures to promote employment are essential if the outcome is not to be high prices and a low level of employment. Four measures can be identified. (i) We must target any additional government expenditure to groups which are less than fully employed, for example the long-term unemployed.[6] Research shows such steps would have very little effect on wage pressure, as the long-term unemployed have largely withdrawn from the labour market. This suggests that any reflation should pay less attention to cuts in taxation and more to targeted increases in expenditure. (ii) We must train the less skilled rapidly for jobs where labour is scarce. This will reduce inflationary pressure coming from this area and at the same time reduce the excess supply of unskilled. (iii) We must encourage investment so that inflationary bottlenecks do not emerge due to a shortage of capital. The problems of monetarism in this regard have already been mentioned, and we return to this issue below. (iv) Finally, and fundamentally, we must have a credible incomes policy, exerting further pressure, *within* the framework of a restrained growth

6. Details of how this could be done are contained in

of money incomes, in the direction of higher output and lower wages and prices.

At the very minimum, an income policy could involve a centrally announced norm, taking into account the projected target growth of money incomes on the one hand, and the extent to which it was hoped to channel this into output growth on the other (the norm would be computed so that the resulting price inflation would 'leave room' for the desired output growth, within the constraint provided by the target growth of money incomes). Of itself, having a norm might help, by bringing home to individual wage bargainers what was likely to govern the climate of settlements elsewhere. Meade (1982) has also showed how, against the background of the norm, arbitration procedures could be used to promote employment.

But perhaps the most promising proposal for such an incomes policy is the wage inflation tax, first put forward in the US and now strongly advocated by Professor Richard Layard.[7] This would penalise companies for paying wage increases above a norm, set nationally and consistent with the target for the rate of growth of money incomes. Such a tax would make it more difficult for employers to accede to wage increases. It would be the microeconomc complement to the macroeconomic deterrent of the money income target, and would make workers more aware of the trade-off between higher pay and higher employment (and might further help to resolve the problem of the prisoner's dilemma in wage fixing).[8] It could not be broken by special groups and could not therefore be discredited. It would also permit free collective bargaining and the decentralised adjustment of relativities. In the last analysis if relativities need to be adjusted or higher rates have to be paid to attract or retain workers, the wage inflation tax does not prevent this happening.

Such a tax could also be made to be unbureaucratic. It could be collected from employers by the Inland Revenue, together with PAYE and National Insurance on a self-assessment basis. The scope for cheating would be minimal and very few extra inspectors would be required.

The problem has always been how to reconcile an inflation tax with the need to encourage productivity bargaining and profit-sharing. Professor Layard has suggested that this can be achieved by simple exemption for genuine cases. This seems workable.[9] Any wider exemption would sink the incomes strategy. If, for example, *all* payments to workers in the form of

7. See Layard (1986) chapter 10, and also see an article by Gavin Davies, Chief UK Economist at Goldman Sachs in the *Guardian* on 27th August 1986.

8. In technical terms, it would increase the elasticity of the demand curve for labour at the firm level, increasing the extra employment made possible by each unit of restraint in the wage paid to workers.

9. See 'Arrangements to Encourage Profit-sharing and to Contain Inflation', available from Professor Richard Layard at the Centre for Labour Economics, London School of Economics.

profit-shares were exempt then companies could simply fiddle their books and declare that some of what they would have paid to workers in wages is now an extra profit-share.

Could profit-sharing itself be a complete answer, avoiding the need for any other form of incomes policy? Professor Martin Weitzman, of Harvard University, has argued that the answer is yes. Profit-sharing makes it less risky for firms to take on workers, for they know that if times in the future turn out to be bad they will not need to pay less than as if times turn out to be good. But workers who agree to profit-sharing are likely to want a say in the *employment* decision. It will be in their interest to keep new entrants out so as to increase their own profit-share. Given this, non-inflationary employment will not necessarily rise as a result of profit-sharing. It may fall. It would be unwise to rely, as Weitzman does, on any major favourable employment effect from profit-sharing alone unless the proposals were modified and developed on the lines which Meade (1986) has indicated in a pamphlet published by the Centre for Public Policy.

In practical terms, all these measures should be presented as employment-promoting initiatives. 'Presentation' in the popular sense would indeed be important, for a set of policies which might just raise the spectre of 'the economist in Whitehall knows best', and be seen as a positive incentive for negotiators and accountants to exercise extreme degrees of creativity. All of them would be carried out within the framework of the target rate of increase of money incomes. That should be presented as the backstop deterrent against inflation.

3. The Co-ordination of Fiscal and Monetary Policy

A new policy-making framework also requires that the interconnections between fiscal and monetary policies be properly specified. This is clearly necessary, now that faith in simple monetarism has been abandoned. If fiscal policy is no longer to be subordinated to the task of achieving monetary targets, or to the Medium-Term Financial Strategy as we at present know it, then what exactly should be the rules for the conduct of fiscal and monetary policies? How can we ensure that fiscal policy plays its part in the overall macroeconomic policy, so that fiscal and monetary imbalance does not damage investment and cause wild exchange rate oscillations of the kind discussed above? In a book published three years ago (Vines, Maciejowski and Meade, 1983) my co-authors and I proposed the following assignment of responsibilities:

(a) Fiscal policy should be used primarily to keep the growth of total money incomes along its desired target path. Such a policy would require quite rapid and frequent changes in taxation in response to new developments in the growth of money income. It would require perhaps

quarterly changes in the rate of value added tax, and in payroll taxes, of perhaps as much as 1 or 2 percentage points per quarter. The rule which specified how taxes respond to changes in money income would need to be carefully designed, using the methods discussed in the final section below. Such a rule for taxation would, for example, show how taxes should be increased, to curtail spending, when money incomes were growing too rapidly. This policy would require the rapid collection of information about developments in the growth of money incomes.[10] One would also have to accept that total money incomes in the economy could not be controlled very accurately by the means of this policy. It would perhaps take a number of quarters for disturbances to be removed. But it would be important for control to be sufficiently rapid that confidence in the money income target was not shaken.

(b) Monetary policy (interest rate policy) should be used primarily to stabilise the exchange rate, with the purpose of stabilising the competitiveness of the economy at some desired level, so that it would be the *real* exchange rate which would be stabilised, rather than the *money* exchange rate. The stabilisation could not expect to be complete, because the foreign exchange market is always being buffeted about by changing sentiments: to neutralise completely the effects of this might require very large changes in interest rates (or very large, even if temporary, intervention in foreign exchange market). Membership of the European Monetary System, or of a wider international monetary system, would assist here. For our recommendations to be possible within the EMS, the rates fixed by the EMS would have to be either set in real terms or else planned as being automatically subject to frequent adjustment in the light of divergences of domestic money prices and cost levels.[11]

(c) Gradually over time the level of competitiveness in the economy ought to be adjusted, through changes in the exchange rate, in turn induced by changes in monetary policy, so as to ensure a satisfactory outcome on the current account of the balance of payments, and more generally so as to ensure that sufficient of the economy's resources were devoted to investment.[12] These changes in competitiveness would have implications

10. Research is at present being undertaken by a PhD student at Cambridge University, Mr Andrew McKay, financed by the Economic and Social Research Council and in conjunction with the Central Statistical Office, into how timely, accurate, and free from revision or seasonal peculiarities such data could be made.

11. The case for membership of the EMS or of a New Bretton Woods is a wide issue, which I do not intend to discuss in detail here. But see the further brief remarks below.

12. A more competitive exchange rate, *ceteris paribus*, would not only improve the current account of the balance of payments, so enabling us to invest abroad, but also (by improving the profitability of domestic industry) encourage investment at home as well. By both of these means a more competitive exchange rate promotes investment.

for the growth of money incomes (a more competitive exchange rate would stimulate money income growth) and it would be important for fiscal policy to be intelligent enough to allow for this interaction of the monetary policy instrument onto a target of policy for which it was not *primarily* responsible. A rigid assignment of instruments to targets, of the kind criticised above, would need to be avoided.[13]

Notice four things about this proposal. First, observe that the rules for the conduct of monetary policy are very different from those described by the Governor of the Bank of England in a recent lecture (Leigh-Pemberton, 1984).[14] Second, it is clear that this use of monetary policy to pursue a competitive exchange rate would not jeopardise the management of money incomes, since this would be pursued primarily by fiscal policy. Dornbusch has been an implacable opponent of such exchange rate targeting for the US,[15] because he believes that exchange rate targeting would jeopardise control over money incomes in the US, where fiscal policy is much less flexible.

Third, observe that this use of monetary policy for an external objective (the competitive exchange rate) would dampen the oscillations in foreign competitiveness, compared with those which occur when monetary policy is assigned to the internal objective of stabilising the growth of money incomes (eg, in the UK from 1979 to the present and in the US from 1982 to 1985). It could lay the ground-work for a re-establishment of an orderly international monetary system, as advocated by Williamson (1983), and ultimately for a New Bretton Woods, as proposed by Meade (1984).

Finally, it is clear that this system of fiscal and monetary policy-making, potentially complex as it is, would need to be designed very carefully. Work which colleagues and I are undertaking at Cambridge goes into this issue in very great detail, using the technical methods to be mentioned in the coming section. A preliminary report on this is contained in a recent discussion paper of the Centre for Economic Policy Research (Christodoulakis, Vines and Weale, 1986).

13. A technical remark. The reader will notice that monetary policy (ie, a nominal variable) is being used to control competitiveness (ie, the real exchange rate, a *real* variable). This is possible only as a result of interactions with the rest of the macroeconomic policy. In particular the successful pursuit of the money income target would ensure that wage indexation would not neutralise the effects of devaluation in the *nominal* exchange rate upon the *real* exchange rate. If wage indexation attempted to do this, it would cause unemployment.

14. In that lecture the Governor gave the impression that it is the responsibility of the Bank to look after all the objectives of policy, seemingly almost without regard for what was done to fiscal policy.

15. See Dornbusch (1980).

4. Technical Methods for the Design of Activist Policy

What technical methods are available for the design of the policies mentioned in the previous sections? The policies are clearly somewhat complex, and they are certainly too complex even to try to apply by the methods of 'common sense', or by the methods of 'flying by the seat of one's pants'.

First, the rigid assignment of instruments to objectives (two unfortunate examples of which were mentioned in the early sections of the paper) will need to give way to the simultaneous use of policy instruments to achieve simultaneously the desired outcome for a number of policy objectives. For example, an unexpected shock in the form of capital outflow will, on the principles outlined above, require a rise in the rate of interest to prevent the exchange rate from collapsing too far and disturbing competitiveness too much. This will cause the growth of money incomes to slacken, and require a sympathetic loosening in taxation to stimulate expenditures somewhat. An intelligent fiscal policy would *anticipate* this requirement. Methods of 'optimal control theory' will be helpful in the use of econometric models to search for policies which would avoid these problems. These methods make use of a policy-maker's objective function, or 'welfare function'. Such a welfare function attaches weights to the various objectives of policy, which are supposed to represent the views of policy-makers, and then shows, conditional on this, how economic welfare would deteriorate as the targets and the instruments of policy deviate from their supposed devoid values. The optimal control methods examine the trade-offs between more closely achieving the desired value for one target and less closely achieving the desired values for the instruments and for the other targets (see Pagan and Preston, 1981).

Second, 'classical control theory' will be important (see Vines, Maciejowski and Meade, 1983, Part 4 for a simple exposition) in allowing us to examine in detail the extent to which the policies are likely to be successful in dampening fluctuations. Control engineers have much of value to offer us here from their experience in feedback systems design, for example the design of automatic pilots for aeroplanes. These methods view the economy as a set of differential or difference equations, and feedback policies are designed to influence the solution of these equations, so that the fluctuations in them die out quickly. For example, it is important that increases in indirect taxes, designed to restrain an over-rapid growth of money incomes, are not so violent as to provoke a rise in wages, and thus in prices, which actually causes a further increase in the growth of money incomes. For that would require further increases in indirect taxes, etc, etc, and the policy would be unstably out of control.[16]

16. A technical remark. In continuous time this stability requirement means ensuring that the roots of the differential equations have negative real parts and large absolute value.

Third, economists need to recognise that economic agents are intelligent—in the way that aeroplanes are not—so that the design of policies will have to allow for the fact that participants in the economy change their behaviour as a result of the policies which are applied (Lucas, 1976). The 'rational expectations' revolution has so far shown us what to do about this if the policies are fully understood. Policies like those described previously can now be designed using an econometric model, on the assumption that people understand these policies very well; so well in fact that they base their actions exactly upon the predictions of the model about the effects of both present *and* future policies! But this is not really satisfactory. Finding ways to design policies which work well and are robust, when these policies are not fully comprehended and yet do cause changes in behaviour, is now the major technical challenge of policy design.[17]

Conclusion

This article has explained why there is now a void in the theory of macroeconomic policy. It has shown what we can learn from the Keynesian revolution, and from the monetarist counter-revolution. I have laid out a new framework which, it is my hope, will help to shed light upon our darkness.

It must be admitted that everything is at present very uncertain. At the very least this means that policy needs to be cautious, rather than confidently committed to a set of prescriptions, even when these are appearing to go wrong. That too—the need for humility—is something that we can learn from both the Keynesian and the monetarist eras of the recent past.

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17. See Currie (1985) for a very clear, non-technical, discussion of this challenge.

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MACROECONOMIC EFFECTS OF FISCAL AND MONETARY POLICY CHANGES

Introduction

1. The academic literature on macroeconomic policy is overwhelmingly of the abstract theoretical variety, and analysis using simulations on macroeconometric models is scarce by comparison. What simulations studies there are typically involve rather mechanistic comparisons between different fiscal and monetary policy instruments and different models, with the emphasis on numerical results. They have tended to neglect some of the wider issues, for example concerning the specification of policy and the treatment of expectations, which the theoretical literature tells us are crucially important in the analysis of policy.

2. This paper attempts to address these wider questions with reference to simulations using the Treasury Model. As well as illustrating a number of issues concerning simulation design, we aim to show how, and to what extent, the estimated effects of policy changes differ with differing assumptions. In doing so, we attempt to relate the simulation results to the basic theoretical structure of the model.

3. One of the implications in the paper is that - given the uncertainty surrounding some of the key relationships in the Treasury and other models, and particularly in the treatment of expectations - it would be unwise to put too much emphasis on the precise numbers emerging from model simulations. We therefore concentrate more on the nature of the effects involved; for example, the extent to which changes in nominal demand feed into prices rather than output, or the effects of changes in the mix of policy on the structure of the economy, and the way these responses vary over time.

4. We are concerned here primarily with the effects of policy operating through the demand side. In practice, changes in taxes and particular types of public spending are also likely to have supply side effects (which could, in the long run, be more important). These effects are largely, though not entirely, absent from the Treasury Model, as they are from most other large macroeconomic models. The model makes no allowance, for example, for the possible effect of public investment (or, for that matter, private investment) on the size and quality of the total capital stock and hence on productive potential; or of government training programmes on the quality of the labour force; or of changes in taxation on incentives. By overlooking these factors commentators have often drawn from simulation results unwarranted conclusions about the relative effects of different fiscal measures on output and employment in the long run.

5. The paper is organised as follows. In Section I, we describe briefly the prior adjustments we have made to the published version of the Treasury model, the most important of which is the assumption of consistent expectations. Section II then discusses issues relating to the specification of policy simulations, the emphasis being on the appropriate representation of the policy framework within which changes are assumed to occur, and the implications of consistent expectations for simulation design. The next two sections deal with, respectively, simulations of changes in the policy mix (including alternative rules for the operation of monetary policy) and changes in the overall policy stance. Section V discusses alternatives to the assumption of consistent expectations: this has a number of aspects, and we look separately at the subsidiary assumptions of rational expectations, perfect foresight and the credibility of announced policy changes. Section VI considers the sensitivity of the simulation results to variations in some of the key relationships in the model (those determining earnings and trade volumes are the main examples) and assesses how robust the main results are over a range of reasonably plausible assumptions.

6. We assume throughout that where there is no direct impact on the supply side, the long run effects of macroeconomic policy on output, employment and other real variables are likely to be small. This conclusion is arrived at mainly by consideration of the underlying theoretical properties of the Treasury model: it is very difficult to make clear statements about the long run based solely on simulation results, since adjustment is seldom completed within a feasible simulation period. There is, however, evidence from some simulations that the model is tending towards the sort of long run equilibrium we describe.

7. The final section gives some conclusions. As far as simulation results are concerned, we suggest that short run real effects can be attributed almost entirely to differing speeds of adjustment in different markets (goods, labour, foreign exchange), which in turn bring about changes in relative prices. Given the importance of adjustment lags in the model, it is not surprising that the particular expectations assumption can have a significant effect on simulation results. It also means that, generally speaking, the consequences of amending key model relationships can be related directly to their effects on relative speeds of adjustment.

8. The main methodological arguments in the paper are, firstly, that considerable importance should be attached to setting up an appropriate policy framework (normally in terms of intermediate objectives) and, secondly, that simulation results should be accompanied by an assessment of their sensitivity to

the main behavioural assumptions, particularly with regard to expectations formation, which underlie the model.

I THE MODEL

9. All the simulations in this paper have been run using an amended version of the 1987 Treasury Public Model. The latter included a new equation for the determination of earnings (see Rowlatt (1986)), but was in most other respects similar to the 1986 Public Model described in Melliss (1986).

Expectations

10. In terms of its effect on simulation properties, the most important amendment we have made to the standard model is to overwrite the equations for the expected exchange rate and the expected long term interest rate (the two main expectational variables in the model) by an assumption of rational expectations with perfect foresight. This implies that the expected values of these variables and the values generated in a model simulation are set equal in each period, and the assumption is therefore referred to as one of consistent expectations. This is discussed further in section V, and in more detail in Westaway and Whittaker (1986). Use of consistent expectations requires the imposition of terminal conditions on the expectational variables (or, more accurately, on the solution of the model as a whole), and in the simulations in this paper we require that at the terminal date:

i. the basic balance (current account plus structural capital flows) is zero, and

ii. long term interest rates have stabilized, so that the expected capital gain on government bonds is zero[1].

Rational agents are assumed to form their expectations on the basis that these conditions will hold in equilibrium, and that equilibrium has been achieved by the terminal date (assumed to be nine years from the beginning of the simulation).

Funding

11. Since 1985, the authorities have operated a policy of "full-fund" of the PSBR. Sales of public sector debt outside the banking sector are set approximately equal to the PSBR in any given financial year.

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1 In practice, it is sufficient for both consistent expectations and the associated terminal conditions to hold relative to the simulation base. There is an implicit assumption that the base embodies a rational expectations equilibrium.

12. The Treasury model equations, however, as they stand, will not ensure that this requirement is met in simulations. Debt sales in the model are determined mainly by the equation for M3 (formerly £M3), which allocates the private sector's gross sterling-denominated wealth between broad money and bonds according to, amongst other things, relative rates of return. For the simulation model used in this paper, we have inverted the M3 equation so that the relative rate of return on bonds (ie the slope of the yield curve) changes in order to satisfy the funding requirement, period by period. The model equation for the yield curve (the RLONG equation) is therefore overwritten.[2] In making this change, we also found it necessary to increase the implied degree of substitutability between money and bonds in the model (by a factor of ten[3]), so as to produce plausible long term interest rate responses in simulations.

Cash Limits

13. The Treasury model equations allow complete flexibility in the setting of cash limits. The detailed assumptions we have made for this exercise (as well as assumptions regarding local authority expenditure and finance, and the national insurance fund) are explained in Annex III. Broadly speaking, non-demand-determined expenditure is assumed to be fixed in cash terms in the first year of a simulation. In subsequent years, we allow some slippage in the cash value of expenditure as the price level changes relative to base: if the overall policy framework is an accommodating one (as defined in the next section), nominal expenditure changes in line with prices; if policy is non-accommodating, half of any change in prices is reflected in higher nominal expenditure and half in lower real expenditure. This is intended to be a reasonably "neutral" representation of the likely outcome for public expenditure, and is not a formal model of the government's decision-making process.

II. SIMULATION SPECIFICATION

14. This paper is about the effects of changes in fiscal and monetary policy. In practice, of course, these changes will be brought about by altering the settings of the various policy instruments at the authorities' disposal. But decisions which involve changes in tax rates, spending plans, interest rates, and so on, are not taken

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2 We make a distinction between "funding policy" and "monetary policy". The former determines the term structure of interest rates; the latter their general level.

3 This adjustment is not as extreme as it may seem. The model coefficients are very small, and were imposed rather than estimated.

in a vacuum. For example, if a government chooses to raise or lower a particular tax rate (whether or not the decision was taken on macroeconomic grounds), we would generally expect it to assess:

i. the extent to which the tax change involves an ex ante change in fiscal stance;

ii. whether the change in fiscal stance is desired and, if not, which other fiscal instrument will be used to offset it, or

iii. if some change in fiscal stance is intended, whether it should be accompanied by a countervailing (or, possibly, reinforcing) change in monetary policy.

15. This implies that, in general, the effects of a change in a particular policy instrument cannot be analyzed without first specifying the overall policy framework within which that change is assumed to take place. If, for example, the government of the day were to express its fiscal policy objectives in terms of a target for the budget deficit, it would be unrealistic to consider a change in tax rates or public expenditure where the implied change in the budget deficit was entirely endogenous (ie subject to the responses of the private sector, and to changes in other variables which affect the budget deficit, such as the level of interest rates). Likewise, if monetary policy were characterized by a target for the money supply, a change in policy should be represented not by an unconditional shift in the level of interest rates, but by a change in the monetary target. We are suggesting, in other words, that for a given policy regime it should be changes in stance which we stimulate (since it is the stance of policy which is formally exogenous), rather than changes in instrument settings per se.

16. Indeed, with forward-looking expectations, simulations which are specified in terms of "open loop" changes in instrument settings will often fail to produce stable solutions: for example, a sustained change in nominal interest rate, on its own, can produce an explosive path for real interest rates, and hence demand; similarly, a change in tax rates can generate an explosive path for the budget deficit, and hence for debt interest payments and real interest rates. By contrast, a reduction in nominal interest rates brought about by a tightening in both fiscal and monetary policy will generally be perfectly sustainable; and a reduction in tax rates which is made conditional on a particular change in the PSBR ex post cannot, by construction, destabilise the budget deficit, since rising debt interest costs will automatically imply smaller tax cuts (though this does raise the possibility, described later, that tax rates will then become unstable).

Money GDP

17. In this paper, we describe the framework of macroeconomic policy in terms of an objective for growth in money GDP. This is the most convenient representation of the present Government's approach to macroeconomic policy, as set out in the MTFS. Although in early versions of the MTFS objectives were expressed in terms of monetary aggregates, rather than money GDP itself, and the emphasis on different aggregates and other indicators has changed over time, the fundamental principle has been essentially the same since 1979. The use of a nominal rather than a real objective as the basis for macroeconomic policy can be justified by:

i. an underlying model of the economy in which the "real" equilibrium of the economy is largely independent of the inflation rate, and

ii. the need for a policy framework which provides a commitment against both inflationary pressure and deficient demand in the economy.

18. In principle, the money GDP objective should be raised or lowered in order to accommodate shifts in the economy's productive potential. However, the effects of macroeconomic policy on productive potential are very small in the model, and so their consequences for the desired path of money GDP are ignored in this paper.

The stance and mix of policy

19. Both fiscal and monetary policy can affect the growth of money GDP, and the balance between them can influence the composition of demand in the economy (consumption, investment, net overseas trade) as well as the split between output and inflation in the short run for any given change in money GDP. This suggests consideration of two types of policy change;

i. a change in overall policy stance, represented by a change in the growth rate of money GDP, for a given mix of fiscal and monetary policy, and

ii. a change in the mix of fiscal and monetary policy for given money GDP growth.

All macroeconomic policy changes can be characterised by one or other of these, or by some combination of the two. The first is of interest in the context of strategies for changing the rate of inflation or stabilising nominal demand, for example after a shock or over the cycle. The second is of interest from the point of view of longer term objectives concerning the structure of demand and the accumulation of wealth in the economy. Both types are illustrated in this paper.

20. Changes in fiscal stance are represented here by changes in the PSBR, expressed as a share of money GDP. The authorities are assumed to use one of two fiscal instruments, public investment expenditure and personal income tax; and one monetary policy instrument, the short term interest rate. We interpret changes in fiscal stance which are accompanied by unchanged real short term interest rates[4] as implying no change in the mix between fiscal and monetary policy. In contrast, a combination of higher PSBR and higher real interest rates, for given money GDP, is interpreted as a relative loosening of fiscal policy and tightening of monetary policy.

21. It is a familiar result in macroeconomic theory (see Blinder and Solow (1973)) that this last combination - a change in fiscal stance with non-accomodating monetary policy - may, depending on the parameters of the underlying model, have to be reversed at some point in the future. For as long as a fiscal expansion is maintained in these circumstances, the ratio of public sector debt to money GDP will be rising, tending to push up real interest rates. Higher interest rates and an increasing debt burden both add to public sector debt interest payments, and this may set off a spiral - involving either further increases in the PSBR, debt, interest rates and so on, or (as in our case, where the increase in the PSBR is fixed ex post) an accelerating change in the "residual" fiscal instrument (eg a rising tax rate), so as to offset the rising cost of debt-service.

22. If market expectations are purely adaptive - or if forward-looking expectations have little impact on current behaviour - it may be reasonable when simulating the medium term effects of policy changes to ignore the fact that some combinations of policy change may have to be reversed in the long run. But with consistent expectations and a model in which (as we shall see) expectational variables are important, the problem of unsustainable policies cannot be ignored.

23. Except in section V, where we consider some alternative approaches, all the simulations in this paper which involve a change in policy mix therefore assume that policy is realigned after five years, reverting to the same mix and overall stance of policy as in the base. Given that expectations are assumed to be consistent, this realignment is perfectly anticipated from the beginning of the simulation period. The choice of year 6 as the date of realignment is, of course, an

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4 This is assumed to be the most accommodating sustainable monetary policy option possible. It will not generally be feasible, for example, to maintain unchanged nominal interest rates with an inflationary or deflationary change to fiscal policy, particularly in an economy with very "open" capital markets.

arbitrary one. Because the terminal date for the simulations occurs at the end of year 9, realigning any later than year 6 would risk severely distorting the results[5] (see Wallis et al (1986), p52). On the other hand, it is useful to have the realignment occurring beyond the medium term, this being the period for which simulation results are normally presented. Realignment after five years therefore seems a reasonable compromise.

24. Changes in the overall stance of policy without changes in the mix are not necessarily unsustainable. In these simulations we do not, therefore, assume that policy is expected to be reversed.

III CHANGING THE MIX OF POLICY

25. In this section, we consider the effects of increasing the PSBR by one per cent of GDP ex post, using short term interest rates to maintain an unchanged path for money GDP. This is the "looser fiscal policy - tighter monetary policy" case described earlier. Since the effects are likely to differ significantly depending on whether the fiscal expansion takes the form of higher spending or lower taxation, we compare the results for two representative fiscal instruments, general government investment and personal income tax[6].

26. It is worth noting at this point that the simulations could equally well have been calibrated in terms of a given change in short term interest rates, with money GDP maintained by an offsetting shift in fiscal stance. Which particular instrument is assigned to the money GDP objective has no significance for the results, and it is not our intention to imply that either one is more appropriate as the residual instrument than the other (indeed, in the next section, fiscal and monetary policy are used together to alter growth in money GDP).[7]

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5 For a similar reason, we are not able to assume that realignment occurs beyond the terminal date. Since the terminal conditions are, in a sense, equilibrium conditions, it would be wrong to impose these at a point in the simulation where the economy was still on an unstable path.

6 Changes to personal income tax are assumed to take the form of higher or lower personal allowances, rather than changes in marginal tax rates.

7 Even if we included an additional objective (eg a target for external balance in the short run), it would still not be necessary to make an assumption about the assignment of instruments. In fact, an optimal solution will generally involve the application of both instruments to both targets.

27. In what follows, it should be borne in mind that financial markets are assumed to anticipate a reversal of the change in policy mix. An alternative, discussed later, is to assume that markets expect that the government will be unable or unwilling to reverse the fiscal expansion after five years, and will choose instead to accommodate it by faster monetary growth. In these circumstances, the short term effects of the same change in policy mix would be quite different (see section V).

Output and inflation

28. Charts 1a and 1b show the effects of the change in policy mix on the level of output (GDP) and the RPI inflation rate (more detailed results are given in Annex I). The main feature of these results, requiring some explanation, is the significant though temporary improvement in the split between output and inflation. This occurs both for increases in public spending and for cuts in income tax, though the rise in output is bigger, on average, and more prolonged, in the case of lower taxes.

Effects of a change in policy mix with unchanged money GDP

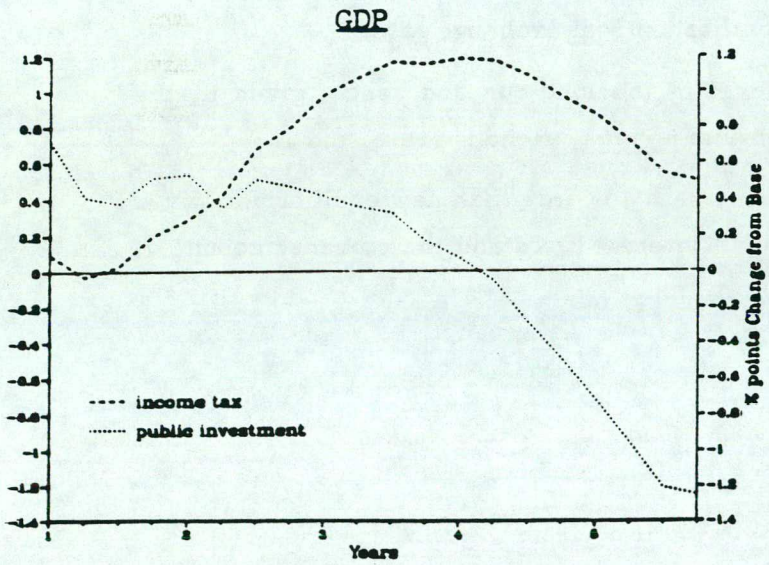

CHART 1a

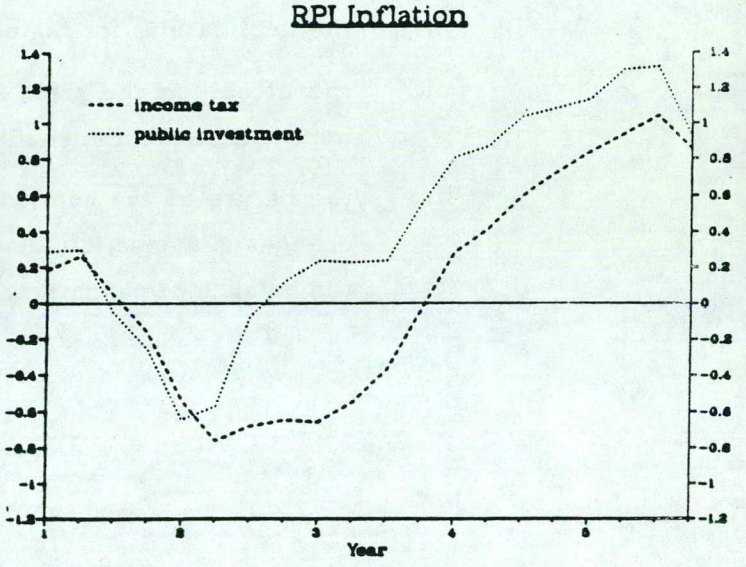

CHART 1b

29. Since policy is operated so as to maintain the same level of aggregate nominal demand, it follows that for the change in policy mix to raise the level of real output (as Chart 1 shows), it must somehow generate a corresponding reduction in the level of prices (relative to what they would otherwise have been)[8]. In practice, there are three processes tending to alter prices:

i. pressure-of-demand effects in domestic markets for goods and labour

ii. exchange rate effects

iii. the effects of fiscal changes on relative prices and wages.

30. The direct effect of a relative loosening of fiscal policy is generally to raise domestic demand, and worsen net trade (see Chart 3 in paragraph 42). Pressure-of-demand effects will therefore tend to imply higher, rather than lower, prices and wages. On the other hand, the model suggests that adjustment of domestic prices to changes in excess demand is a comparatively slow process (this phenomenon is referred to again, in later sections). Over a three or four year period, therefore, pressure-of-demand is unlikely to have much effect on the aggregate price level.

31. By contrast, the role of the exchange rate in explaining short run changes in the output-inflation split is a crucial one. When the shift in policy mix is announced, operators in the foreign exchange market will have to assess:

i. the implications for the equilibrium <u>real</u> exchange rate;

ii. the effect on the price level in the long run and hence, given i., the implications for the equilibrium <u>nominal</u> exchange rate, and

iii. the nature of the adjustment path towards that new equilibrium, given changes in domestic (nominal) interest rates and the current account of the balance of payments.

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8 This is true by identity if prices are measured by the GDP deflator; it will <u>tend</u> to be true for other price indices too, although clearly short run changes in retail prices may be influenced by factors, such as mortgage interest rates, which do not affect the GDP deflator.

32. As far as i. and ii. are concerned, a rational currency speculator should conclude that a temporary shift in the mix of policy, within a framework which effectively ties down the long run price level, will have no appreciable effect on either the real or the nominal equilibrium exchange rate. It is conceivable that the change in the net overseas asset position during the period of the fiscal expansion could have some lasting effects on the real exchange rate (if the effects on net IPD[9] and structural capital flows are not offsetting), but this is likely to be of second-order importance.

33. In principle, there could also be long run real exchange rate changes if the shift in policy mix led to a permanent change in the domestic capital stock. But in the Treasury model, the capital stock is not explicitly identified, and there is no link between investment expenditure and long run productive potential.

34. In stage iii, the relative weight given to interest rates and the short term prospect for the balance of payments in determining the current value of the exchange rate will depend on the degree of subtitutability between domestic and foreign assets (and hence also on the degree of international capital mobility). In the limit, with perfect substitutability, current account deficits can be financed for ever at world real interest rates. The current level of the exchange rate would then be determined solely by the expected equilibrium exchange rate (which we have suggested will be more or less unchanged for a temporary shift in policy mix), and the uncovered interest parity condition. This would imply an upward jump in the exchange rate, when the policy change is announced, so that the rise in domestic interest rates generated by a tightening of monetary policy could be offset by an equivalent increase in the expected rate of currency depreciation[10].

35. In fact, the Treasury model assumes that sterling and foreign currency assets are rather less than perfect substitutes. But as Charts 2a and 2b show, our results nevertheless conform quite closely to those of the standard "overshooting" model, with an immediate upward jump in the exchange rate of 2-4 per cent, depending on which fiscal instrument is being used. It is this initial rise in the exchange rate which contributes most, over the first year and a half, to the lower rates of inflation associated with a relative tightening of monetary policy[11].

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9 Interest, profits and dividends.

10 These movements can be expressed in real or nominal terms, as can the uncovered interest parity condition.

11 Less-than-perfect substitutability means that sterling rates of return have to rise far enough to finance the deterioration in the current account. Hence, the exchange rate jumps up by less, and then depreciates more slowly, than it would with perfect substitutability.

36. As we have said already, given fixed money GDP, lower inflation must be associated with higher output. This comes about through a combination of higher real incomes, reflecting the improvement in the terms of trade, and positive real balance effects, offset to some extent by poorer international competitiveness.

37. Note that the initial output gain is bigger for higher public spending than for lower income taxes. This is because the direct impact on domestic demand is greater for public spending increases - less of the stimulus leaks into saving and imports. Consequently, the offsetting rise in interest rates needed to keep money GDP on track is bigger; the expected depreciation of the exchange rate is greater; and so the initial upward jump in the exchange rate (and hence reduction in inflation) is also bigger. Of course, as the exchange rate depreciates from its new level, inflation begins to pick up again. This combines with the effects of higher real interest rates to crowd-out the initial output gain , as is apparent in Chart 1.

INCOME TAX

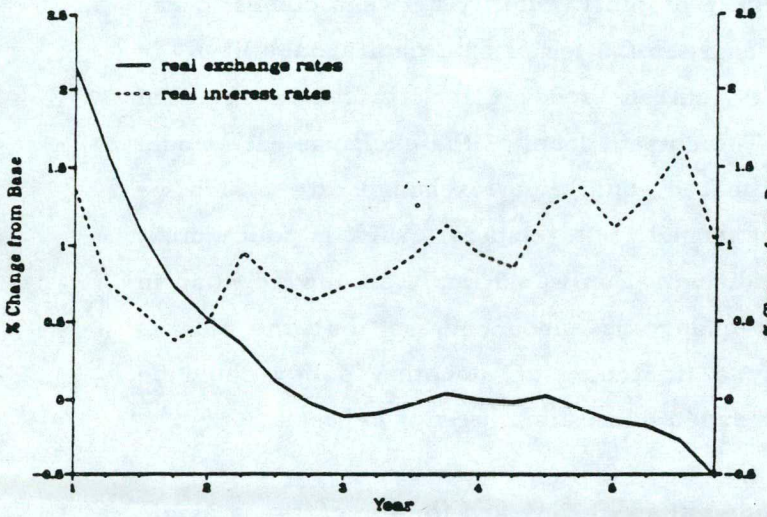

CHART 2a

PUBLIC INVESTMENT

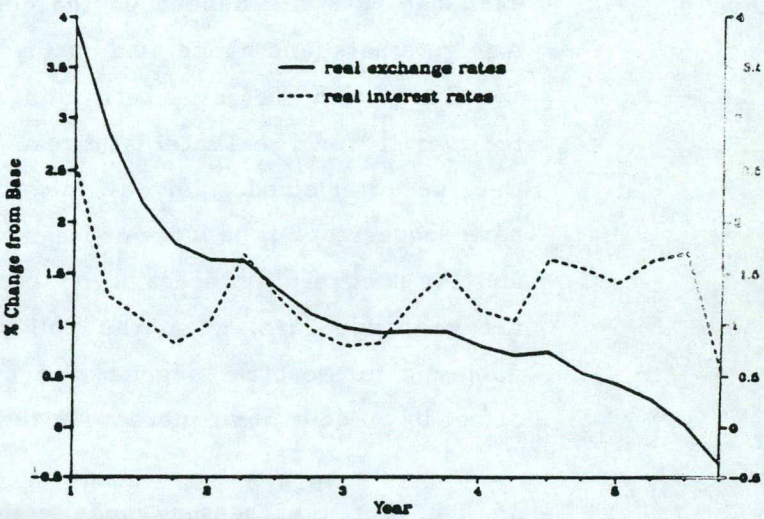

CHART 2b

38. From about the second year onwards, the most significant difference between the effects of higher spending and lower taxes can be attributed to the direct effect of income tax cuts on pay settlements. A lower rate of income tax, whether brought about by lower marginal rates or higher allowances, directly increases employees' take home pay, for a given level of earnings (ie raises the "retention ratio"). Incorporated in the Treasury model is the assumption that wage-earners are concerned more with take home pay than with levels of gross pay. Consequently, they are prepared to accept lower wage increases when income tax

is reduced (the labour supply curve shifts rightwards), and will press for higher increases when income tax rises.[12] (See Rowlatt (1986)).

39. From firms' point of view, therefore, lower income taxes tend to reduce real product wages, and hence unit labour costs. Chart 1b shows how, for a switch in policy involving lower income tax, this retention ratio effect sustains the initial fall in inflation for almost twice as long as in the case of higher public spending, with a correspondingly bigger rise in output.

40. If the reduction in taxes could be maintained - for example, if it were "financed" by lower public spending - the Treasury model would predict a permanent rise in output (ie the long run balanced budget multiplier in the model is negative). Knoester (1983) describes this phenomenon as the "inverted Haavelmo effect". Intuitively, this shift in the supply curve arises because the income tax cut reduces the distortionary wedge between the real consumption wage and the real product wage. Lower national insurance contributions (employers' or employees') would have a similar effect, as would cuts in indirect taxes.

41. In the simulations reported here, however, we assume that the tax cut (or spending increase) is reversed after five years. If there were any long run effects at all on output and inflation, they would therefore be a result solely of the change in asset positions brought about during the initial five year period. As was suggested earlier, these effects are likely to be negligible, in the Treasury model at least, particularly given a base in which the economy is growing (since incremental changes to asset stocks would in this case become increasingly insignificant in relation to the level of income).

The composition of demand

42. As well as affecting the level of output, in the short to medium term at least, a change in the fiscal-monetary mix also tends to alter the balance between consumption and investment in the economy. This is illustrated in Charts 3a and 3b below, which show changes in the value of consumption, domestic investment, and the current account (ie net overseas investment) as a share of money GDP. The changes in real interest rates and the real exchange rate, discussed earlier, are part of the mechanism bringing this about.

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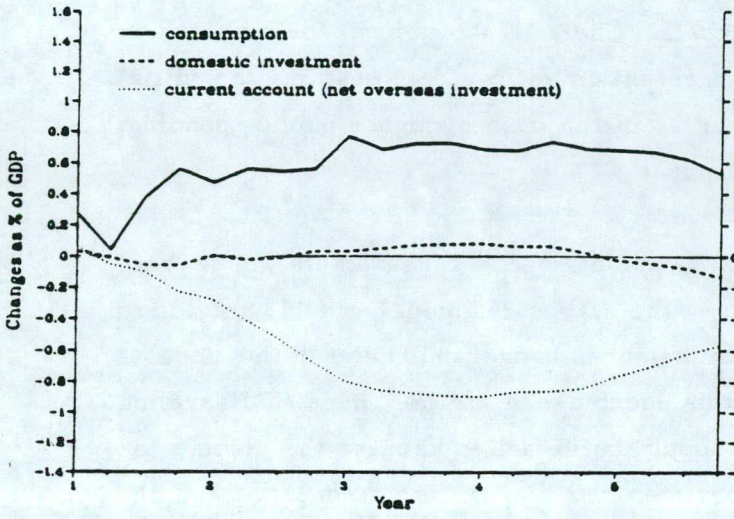
12 This effect is consistent with the historical evedence but is not well-determined empirically, and in section VI we consider a simulation in which it is excluded.

INCOME TAX



PUBLIC INVESTMENT

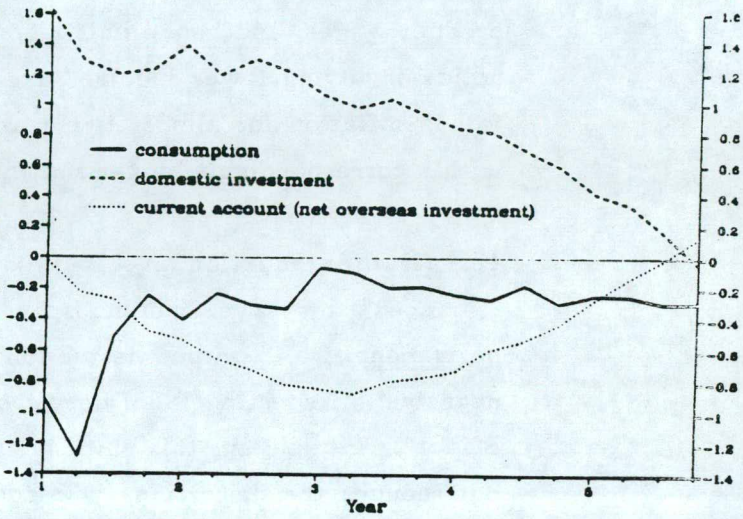


CHART 3a **CHART 3b**

43. Clearly, in the case of higher public expenditure, the picture is heavily influenced by our assumption that all of the extra spending is investment. But there are a number of other factors at work too;

- most of the initial offset to higher investment takes the form of lower consumption; this is brought about largely by adverse wealth (revaluation) effects due to higher interest rates and a higher exchange rate;
- after a year or so, most (but not all) of the effect on consumers' expenditure has been unwound, as the stock of consumer durables approaches its new equilibrium;
- this is matched partly by a deterioration in the current account (reflecting a higher real exchange rate), partly also by a gradual decline in the share of total investment in GDP; private investment is crowded-out by higher real interest rates, and public investment by steadily rising debt interest costs (given the revised PSBR constraint).

44. In principle, this last effect could apply also in the case of lower income tax. As debt interest costs rise, the initial reduction in income tax would be gradually "squeezed out". But, in practice, over the five year period during which the policy change is implemented, the beneficial effects of lower income tax on real earnings (via the retention ratio), and hence on the public sector's wage bill, fully offset rising debt interest payments. As a result, in contrast to the higher public spending case, the initial rise in domestic absorption is maintained for much longer, implying a more persistent deterioration in the current account (see Chart 3a).

45. These structural effects provide one argument against making temporary shifts in the mix of policy, to take advantage of the generally favourable short term effects on output and inflation. A move towards lower taxes, a bigger fiscal deficit and higher real interest rates reduces inflation and raises output in the short term, but only at the "cost" of a decline in the stock of national wealth (defined as the sum of domestic wealth and net overseas assets).

46. Whether this is a good or a bad thing clearly depends on what is the desired stock of wealth: in some circumstances it may be considered beneficial to bring forward a part of future consumption to the present. But if in the base, the real interest rate is equal to the social rate of time preference, and the level of wealth is consistent with that rate, a change in the fiscal-monetary mix will generally involve some welfare loss on this account (see Vines et al (1983)). This needs to be set against the welfare gain from temporarily higher output and lower inflation.

47. The argument becomes more complicated in the case of a change in policy mix which involves at least an element of higher public investment. This may involve a higher, lower or unchanged level of welfare, depending on what proportion of the fiscal expansion is accounted for by investment, and on the efficiency of public investment relative to the other domestic and overseas investment which it crowds out.

48. There are a number of other reasons why it may be unwise for the authorities to exploit the possibility of temporary output gains from changes in the fiscal - monetary mix. One is that, as we have seen, what gains there are derive largely from a real exchange rate appreciation, an effect which may not come about if other countries try, simultaneously, to alter the mix of their policies in the same way as the UK (see Currie (1987)). Secondly, there is a risk that, as output growth falls after the first two or three years of the strategy, governments will be tempted to try to offset this by accommodating the rise in inflation, and possibly

by further loosening of fiscal policy. This is a recipe for accelerating inflation and perhaps, ultimately, stagflation. Moreover, if the markets anticipate an outcome of this sort, even the short run gains may fail to materialize, because of adverse confidence effects on the exchange rate.

Alternatives to money GDP control

49. We argued in the previous section that in broad terms, given the MTFS, an objective for money GDP provided the natural framework within which to assess macroeconomic policy changes. However, it could be said that quarter-by-quarter control of money GDP ("optimal control"), as assumed in the simulations discussed so far in this paper, is an overly-stylized representation of policy.

50. In practice, money GDP control is a medium term objective. In the short term, policy has been operated with reference to monetary targets, the exchange rate and other "forward indicators". There are three main reasons for this:

i. initial estimates of money GDP are only available with a one-quarter lag, and even then are generally subject to significant revision as further data become available. Some other, more timely, guide for policy is needed in the interim;

ii. changes in fiscal and monetary policy take time to influence growth in money GDP, making short term control difficult, if not impossible[13];

iii. given the costs involved in continually changing fiscal and monetary policy instruments, it is not necessarily desirable (even if feasible) to try to offset every short term fluctuation in money GDP[14].

51. Although it is beyond the scope of this paper to deal comprehensively with indicator regimes, it is worth looking briefly at how a couple of alternative, perhaps more realistic, representations of the policy framework might affect simulation results. One obvious alternative to short term money GDP control is a monetary target: in current circumstances, a target for MO. Accurate information on MO growth is available extremely quickly; its relation to money GDP is

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13 Attempts to control money GDP precisely in model simulations give rise to instrument instability problems for just this reason. The "fixed money GDP" simulations in this paper therefore have to allow some trade-off between achieving the money GDP target and preventing excessive fluctuations in policy instruments. (See Melliss (1984)).

14 See "Financial Statement and Budget Report 1987-88"; para 2.04.

reasonably stable; it responds rapidly to changes in policy instruments (particularly interest rates); and the fact that its velocity is a function of interest rates means that an MO target automatically allows some short term variation in money GDP.

52. On this last point, however, there is a problem insofar as a sustained change in money incomes with an unchanged MO target can, under certain conditions, be partially accommodated by a permanent change in velocity, so that money GDP will not be brought back to base levels even when MO is kept on track (see Annex II for proof). We therefore consider, as a second option, one in which the MO target is supplemented by a requirement that the money GDP objective should be achieved in the long run. This is implemented via a feedback rule for nominal interest rates (r), with proportional control on MO and integral control on money GDP;

$$\Delta r = 245 \Delta \ln MO + .25 \ln MGDP_{-1}$$

(all variables are measured relative to base). The parameters were chosen by re-running the two fiscal-monetary mix simulations, computing the optimal feedback rules for each[15], and then taking a simple average.

53. Charts 4 and 5 on page19 show how the different policy rules affect the results of a shift in the mix of fiscal and monetary policy - in terms of money GDP control, output and inflation.

54. Chart 5a demonstrates clearly the case against an unconditional MO target as a method of controlling money GDP in the medium term. The rise in interest rates associated with fiscal expansion (see Chart 2) pushes up the opportunity cost of holding MO, and so increases the income velocity of money. An MO target will therefore imply higher money GDP relative to base, as Chart 5a shows. Both output and inflation are higher than would be the case with direct control of money GDP, though the increase in output tends to fall over time (see Chart 5b).

55. The contrast with the case of a reduction in income tax is striking. The important factor here is that MO is held mainly by the personal sector, which is the sector to benefit most directly from lower income tax. The rise in personal disposable incomes relative to money GDP tends to push MO velocity down (ex ante). At the same time, as in the case of increased public spending, the higher interest rates needed to control MO are tending to push velocity up. The net

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15 ie selecting the parameters which minimise the deviations in money GDP from target.

effect in the first three years or so of the policy change is to reduce velocity and hence reduce money GDP (though this is largely fortuitous and is reversed later as interest rates rise further). Lower money GDP is reflected entirely in a lower path for output, on average, than would have been obtained under a policy of direct money GDP control.

56. The endogeneity of velocity is one reason why the authorities have tended not to set unconditional monetary targets for the medium term[16]. The sort of feedback rule described above is a way, albeit a very simplistic way, of modelling a process whereby monetary targets are updated to take account of shifts in velocity. As Charts 4 and 5 show, it delivers far better money GDP control than an unconditional monetary target.

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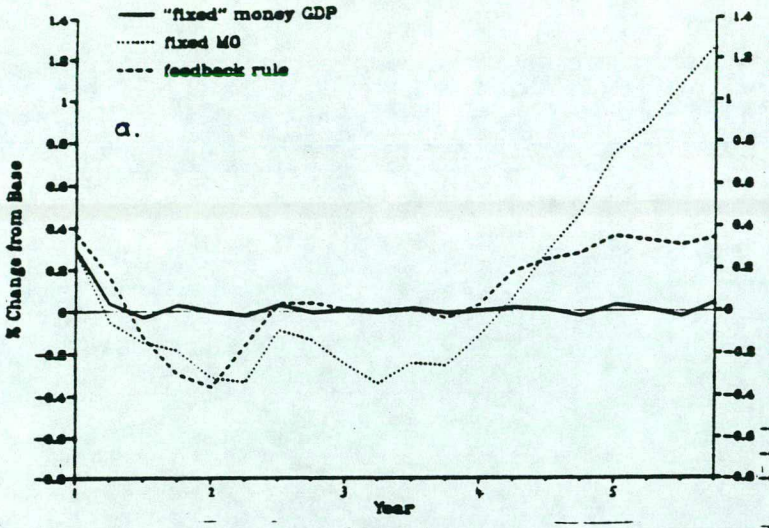
16 In the 1987-88 FSBR, for example, a target is given only for the coming financial year (and even that is a range); beyond the first year published projections for MO growth are "illustrative ranges" rather than targets. (para 2.13, op.cit.)

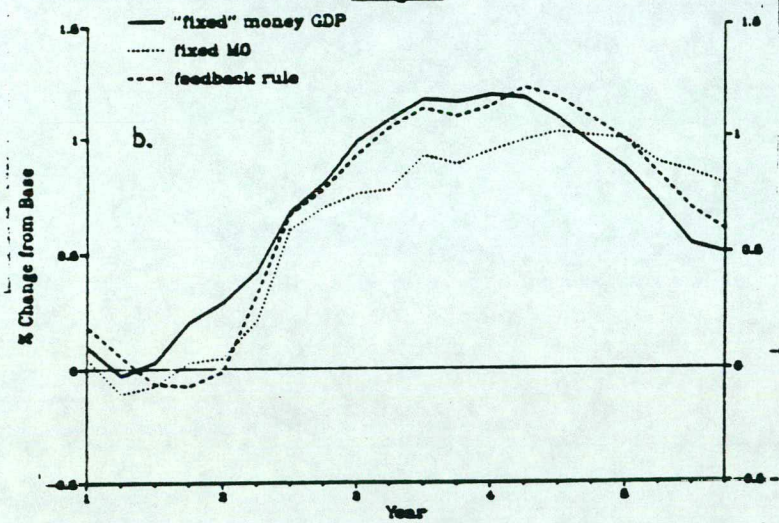
CHART 4:

Lower Income Tax

Money GDP



Output



RPI Inflation

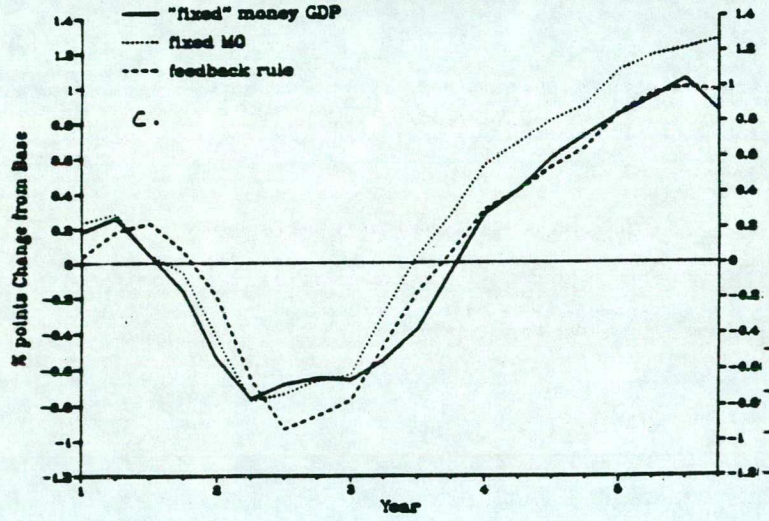
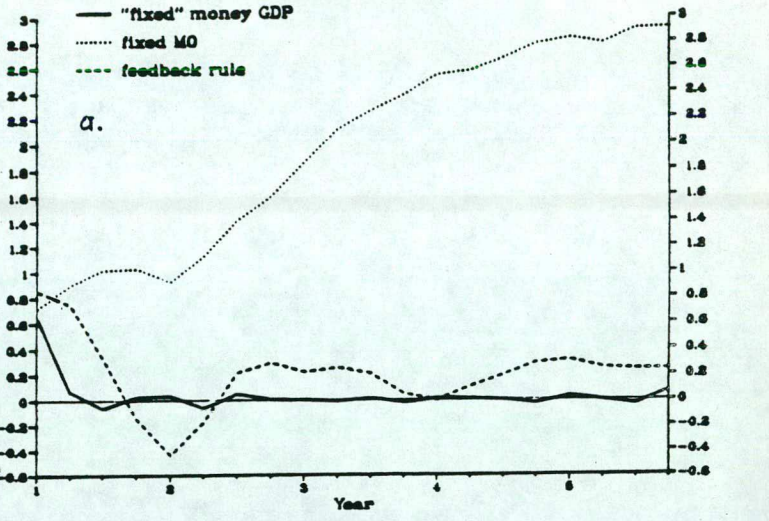


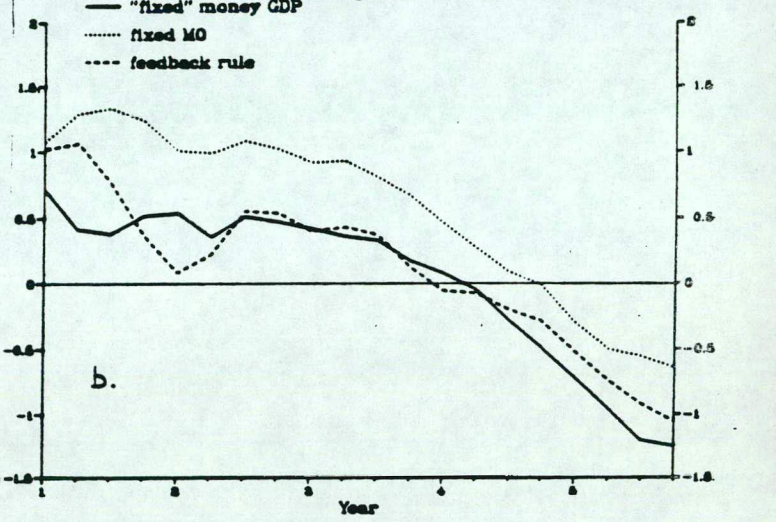
CHART 5:

Higher Public Investment

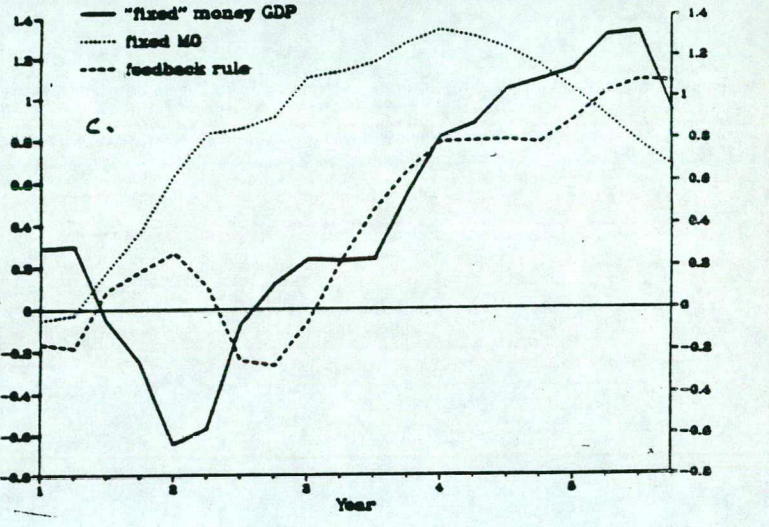
Money GDP



Output



RPI Inflation



IV CHANGING THE OVERALL STANCE OF POLICY

57. In this section, we turn to the second class of policy changes - those which involve an overall expansion or contraction of nominal aggregate demand. We consider the effects of three different policy combinations, each delivering a sustained one point increase in the growth of money GDP:

i. balanced expansion, in which a higher PSBR/GDP ratio is accommodated by faster monetary growth (ie real short term interest rates remain unchanged);

ii fiscal expansion, which involves a bigger rise in the PSBR than in i, and a corresponding increase in real interest rates;

iii. monetary expansion, where all of the stimulus comes from lower interest rates and the PSBR ratio is unchanged.

Since ii. and iii. involve unsustainable changes in policy mix, we assume that after five years they each revert to balanced expansion , as defined in i.

58. The results of simulating a change in the overall stance of policy are summarized in Table A on the following two pages. Having dealt with the differences between the effects of lower income tax and higher public spending in the previous section, we confine ourselves in this section and in the remainder of the paper to one fiscal instrument: personal income tax.

Balanced expansion

59. It is useful, when assessing these results, to consider what sort of effects we would expect to see in the long run - given the underlying structure of the model, and assuming that the change in policy has no direct effects on the supply side. Short run effects can then be viewed as deviations from this steady state. An obvious benchmark against which to measure the long run effects of a sustained increase in money GDP growth is that of "super-neutrality". If the model were super-neutral, we would expect that, in the long run, a one percentage point rise in the growth of money demand would lead to one per cent extra inflation in all other nominal variables, and no change in the level of real variables - including output and employment.

FASTER GROWTH IN MONEY GDP

Sustained increase of 1 per cent point in rate of growth of money GDP, using different settings of fiscal and monetary policy

% change from base in:	BALANCED EXPANSION: Fixed real short rates: fiscal policy accommodating	FISCAL EXPANSION*	MONETARY EXPANSION**
REAL GDP (growth rate			
Year 1 in brackets)	+.5 (+.5)	+.6 (+.6)	+.5 (+.5)
Year 2	+.9 (+.4)	+1.2 (+.6)	+.6 (+.1)
Year 3	+1.2 (+.3)	+1.9 (+.7)	+.4 (-.2)
Year 4	+1.1 (-.1)	+2.0 (+.1)	+.5 (+.1)
Year 5	+.8 (-.3)	+1.6 (-.4)	+.7 (+.2)
Year 6	+.7 (-.1)	+1.2 (-.4)	+.9 (+.2)
RPI INFLATION			
Year 1	+.5	+.5	+.3
Year 2	+.8	+.4	+1.2
Year 3	+.8	+.7	+1.2
Year 4	+1.2	+1.6	+.8
Year 5	+1.3	+2.1	+.5
Year 6	+1.1	+1.6	+1.0
EMPLOYMENT			
Year 1	+.2	+.3	+.2
Year 2	+.8	+1.0	+.5
Year 3	+1.3	+2.0	+.5
Year 4	+1.5	+2.7	+.4
Year 5	+1.4	+2.8	+.6
Year 6	+1.2	+2.4	+.8
REAL EARNINGS			
Year 1	-.5	-.7	-.2
Year 2	-1.3	-1.8	-.4
Year 3	-1.4	-2.3	-.4
Year 4	-1.3	-2.9	-.4
Year 5	-1.3	-3.5	-.3
Year 6	-1.3	-3.1	-.6
CURRENT ACCOUNT (£bn)			
Year 1	-1.2	-1.4	-1.1
Year 2	-1.2	-2.6	+.4
Year 3	-1.2	-4.4	+1.4
Year 4	-.5	-4.8	+1.4
Year 5	+.3	-4.1	+1.2
Year 6	+1.0	-1.7	+.6

* 1½ point increase in PSBR ratio for 5 years; then balanced expansion

** Lower interest rates and fixed PSBR ratio for first 5 years; then balanced expansion.

FASTER GROWTH IN MONEY GDP

% change from base in:	BALANCED EXPANSION: Fixed real short rates: fiscal policy accommodating	FISCAL EXPANSION*	MONETARY EXPANSION**
PSBR RATIO OR MO	PSBR/GDP	PSBR/GDP	MO
Year 1	+.9	+1.5	+.9
Year 2	+.8	+1.5	+1.4
Year 3	+.4	+1.5	+1.7
Year 4	+.2	+1.5	+2.5
Year 5	+.3	+1.5	+3.9
Year 6	+.4	+.8	+5.3
S-T REAL INTEREST RATES			
Year 1	0	+.7	-1.0
Year 2	0	+.4	-.6
Year 3	0	+1.1	-.5
Year 4	0	+1.8	-.8
Year 5	0	+2.6	-1.1
Year 6	0	0	0
L-T INTEREST RATES			
Year 1	+.8	+1.5	-.2
Year 2	+.9	+1.6	-.2
Year 3	+.9	+1.7	-.2
Year 4	+.9	+1.7	-.2
Year 5	+.9	+1.6	0
Year 6	+.9	+1.4	+.1
NOMINAL EXCHANGE RATE			
Year 1	-2.7	-1.7	-3.5
Year 2	-3.3	-2.5	-3.5
Year 3	-3.9	-3.0	-4.1
Year 4	-4.7	-4.0	-5.2
Year 5	-5.7	-5.6	-5.9
Year 6	-6.8	-8.0	-6.4
REAL EXCHANGE RATE			
Year 1	-2.7	-1.6	-3.5
Year 2	-2.7	-2.3	-2.4
Year 3	-2.6	-2.6	-2.1
Year 4	-2.4	-2.7	-2.3
Year 5	-2.3	-3.0	-2.4
Year 6	-2.4	-3.7	-2.3

60. The conditions for full super-neutrality are very strong (see Marini and van der Ploeg (1987)), and are unlikely, particularly in a large econometric model like the Treasury's, to be satisfied. The existence of a non-interest bearing outside asset (cash), for example, is sufficient to prevent super-neutrality; as is the inclusion in the model of a number of exogenous nominal variables (see Wallis and Whitley (1987)).

61. But some of these conditions are more important than others, and there are a number of key respects in which the model we are using does conform to the super-neutral paradigm :[17]

i. nominal interest rates are changed in line with inflation, by assumption;

ii. with rational expectations, fixed real interest rates and a high degree of substitutability between foreign and domestic assets, the exchange rate equation is close to being dynamically homogeneous (of degree one) in domestic prices;

iii. the earnings equation and most of the price equations in the model are, themselves, dynamically homogeneous;

iv. the earnings equation also includes a term in the level of unemployment, suggesting no long run hysteresis;

v. the terminal conditions prevent persistent disequilibria in the balance of payments and the term structure of interest rates;

vi although real cash holdings will fall in response to higher nominal interest rates, cash is only a small proportion of total financial wealth (and even of personal sector liquid assets), so any effect on real consumption is likely to be minimal; and there is no direct link in the model between cash balances and aggregate supply;

vii as explained earlier, the Treasury model does not incorporate any supply side effects from changes in the level of the capital stock (which may occur in the process of adjustment towards long run equilibrium); nor from changes in the level of inflation, eg. to the extent that higher rates of inflation may impair market efficiency or adversely affect "business confidence".

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17 This is probably more true of our amended model than of the Treasury model itself, since points i, ii and v. are special to this exercise. However, it should be emphasised that in neither case are all the conditions for super-neutrality met, and it would be wrong to draw any precise conclusions about the long run from the rather general observations we are making here.

62. This list encompasses the most important influences on long run model properties. It is not particularly surprising, therefore, that the results in column 1 of Table A show signs of tending towards an equilibrium in which, roughly speaking, real growth rates are unchanged - although, by year 6 the process of adjustment is by no means complete. The signs include:

- a gradual decline in the GDP response, from its peak in year 3;
- inflation just over one per cent above base by year 6; we would expect the increase to remain at over one per cent until output returns to base levels;
- a rise in the PSBR ratio of just under ½; this is consistent with an unchanged debt-income ratio in the long run (since the debt-income ratio in the base is around ½);
- long term interest rates rise by close to one point, almost immediately;
- from about year 4 onwards, the nominal exchange rate depreciates by almost exactly one per cent faster than in the base, reflecting a similar rise in short term interest rates.

63. Against this background, the short term effects of balanced expansion - in particular, the temporary rise in real output - reflect "stickiness" in the domestic inflation process. The most important element in this is the tendency, as a lower exchange rate pushes prices up, for earnings to lag behind so that real wages fall for a time. This effect is augmented by a rise in the retention ratio, because of lower income tax.

64. The resulting increase in output sucks in imports and causes the current account to deteriorate, ex ante. With less than perfect capital mobility, the relative return on sterling assets has to rise in order to generate the required capital inflow. Since, by assumption relative real interest rates are fixed, this necessitates an expected appreciation in the real exchange rate. The change in the equilibrium real exchange rate is likely to be small,[18] and the initial response is therefore a downward jump in the real exchange rate, followed by gradual appreciation. This is evident in Table A.

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18 The closer the long run equilibrium is to a super-neutral equilibrium, the smaller the change in the real equilibrium exchange rate.

"Unbalanced" expansion

65. We suggested in section III that a temporary change in policy mix will not significantly alter the steady state equilibrium of the economy. It follows that the long run effects of a change in the overall stance of policy, such as they are, will be more or less unaffected by the inclusion of a simultaneous, temporary, change in policy mix.

66. Similarly, the short term effects of what we have called "fiscal expansion" and "monetary expansion" can be thought of as the effects of a balanced increase in money GDP growth plus or minus (respectively) some element of looser fiscal policy and tighter monetary policy. From section III, we know that this last combination produces a temporary increase in output and reduction in inflation (for given money GDP), because of;

- a stronger exchange rate, and
- the direct effects of income tax cuts on earnings.

Consequently, a stimulus to demand which is biased towards looser fiscal policy and higher real interest rates ("fiscal expansion") will raise output by more in the short run, and inflation by less, than balanced expansion. The reverse is obviously true for monetary expansion.

67. There is one particularly striking feature of the results in Table A that was not discussed in the context of policy mix changes, namely the extent to which the gap between output responses and employment responses varies according to the mix of policy. This reflects the importance of relative factor prices in determining average labour productivity, as Chart 6 suggests.

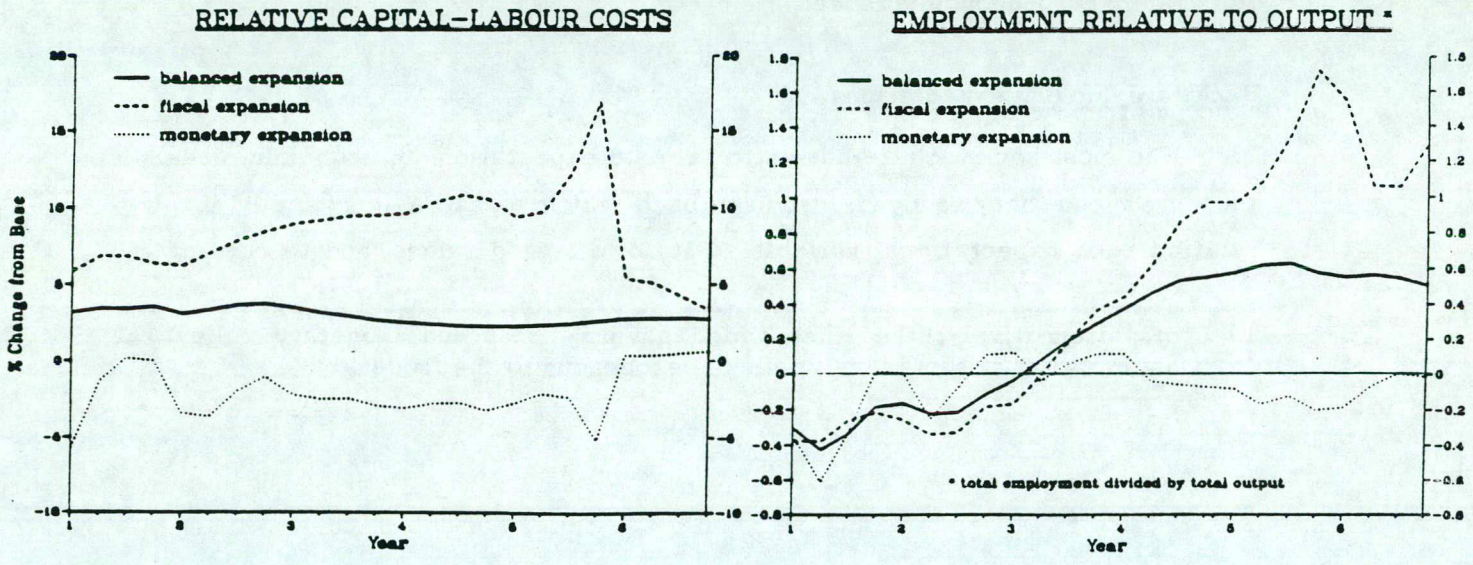

CHART 6

68. A shift towards looser fiscal policy (as specified here) tends to reduce real labour costs, because income taxes are lower, and to raise the real cost of capital, because the general level of interest rates is higher. Relative capital-labour costs rise on both counts, inducing firms to produce a given volume of output with more labour and less capital. This effect is initially outweighed in simulations by the tendency for employment to lag behind output (productivity being pro-cyclical), but is clearly evident after about three years of fiscal expansion. In the long run we would expect relative factor prices, and both output and employment, to return more or less to base levels.

V ALTERNATIVES TO CONSISTENT EXPECTATIONS

69. As we implied in section I, the assumption of consistent expectations comprises two distinct propositions;

i. that markets know the "true" (ie our) model of the economy, and use this to form their expectations;

ii. that markets know with certainty the future paths of the exogenous variables, including the settings of fiscal and monetary policy.[19]

70. The first proposition requires that agents are rational, and that information costs are not so large as to prevent them either using the full model themselves or, more plausibly, acting as if they did (eg by basing expectations on published, model-based, forecasts). We would argue that, for practical purposes, it is reasonable to assume that these requirements will be met. But it is interesting nevertheless to consider how the results we have discussed so far might be affected if agents were to use some much simpler mechanism for the formation of expectations - one which does not involve, directly or indirectly, the solution of a full scale macro-economic model.

Backward-looking expectations

71. The most common alternative to rational expectations in economic models is the single equation, reduced form approach which, because it typically involves relating each expectational variable to its own lagged values, and to current and

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19 or, alternatively, the rules which govern fiscal and monetary policy; we assume that at some level, policy is exogenous to the model.

past values of other relevant economic variables, is usually labelled backward-looking expectations.[20] The Treasury model includes equations of this sort for the expected exchange rate and the expected long term interest rate;

$$\Delta RX^e = f\left(\Delta\left(\frac{M3^*}{M3}\right),\ \Delta\left(\frac{ULC^*}{ULC}\right),\ \Delta\ (r - r^*),\ \Delta NSO,\ \frac{RX}{RXQ}\right)$$

$$R^e = g\left(R,\ r,\ \dot{P}^e,\ \frac{PSBR}{NW}\right)$$

where;

RX	=	effective exchange rate
ULC	=	unit labour costs
r	=	short term interest rate
NSO	=	real value of North Sea oil reserves
RXQ	=	equilibrium exchange rate
R	=	long term interest rate
P	=	domestic price level
NW	=	net private sector financial wealth
*	=	world variable
e	=	one-period-ahead expectation

72. Charts 7 and 8 compare the results of two consistent expectations simulations (one of a change in mix, the other of a change in stance) with simulations of the same policy changes but with the alternative assumption of backward-looking expectations, based on these equations. Consider first the effects of a change in stance, since the differences here are fairly straightforward.

73. It should have become apparent by now, from the discussion in the previous section, that the importance of expectations in the Treasury model lies mainly in the link between the exchange rate and domestic prices. The combination of forward-looking expectations and a flexible exchange rate effectively speeds up the transmission between inflationary shocks (eg changes in policy stance) and increases in the actual inflation rate.

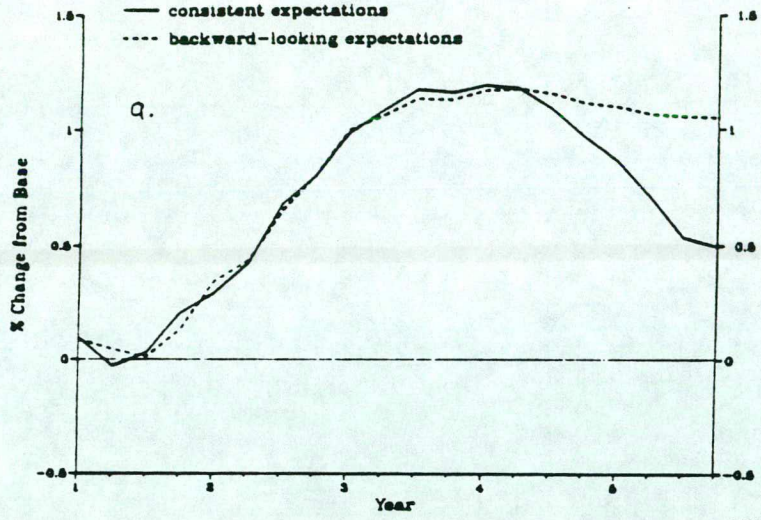
---

20 the distinction between rational and backward-looking expectations is a useful one in this context, even though it can be shown (Muth (1961)) that in some cases the two may concide (ie backward-looking expectations may be unbiassed).

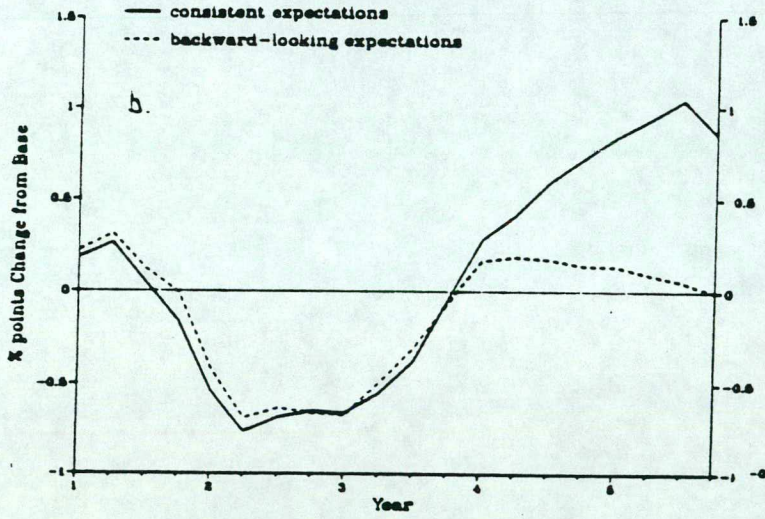
CHART 7

Change in "mix"

GDP



RPI INFLATION



NOMINAL EXCHANGE RATE

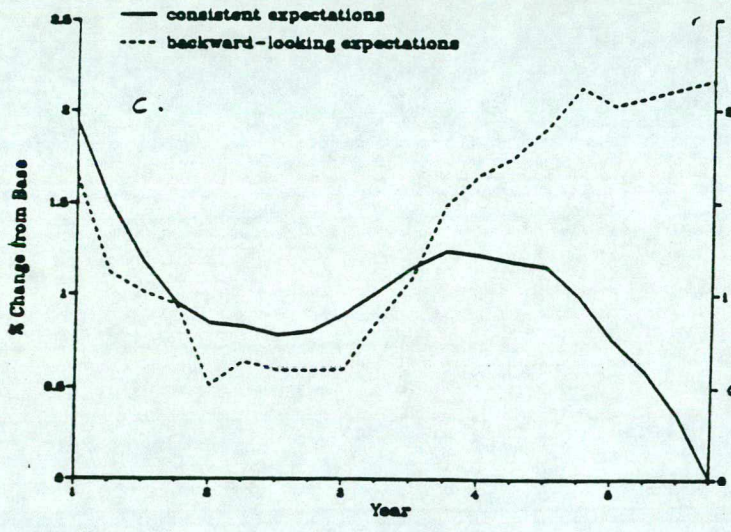
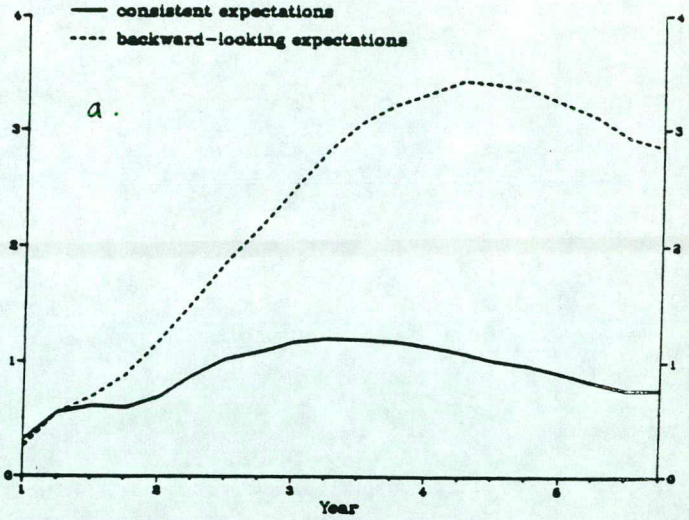


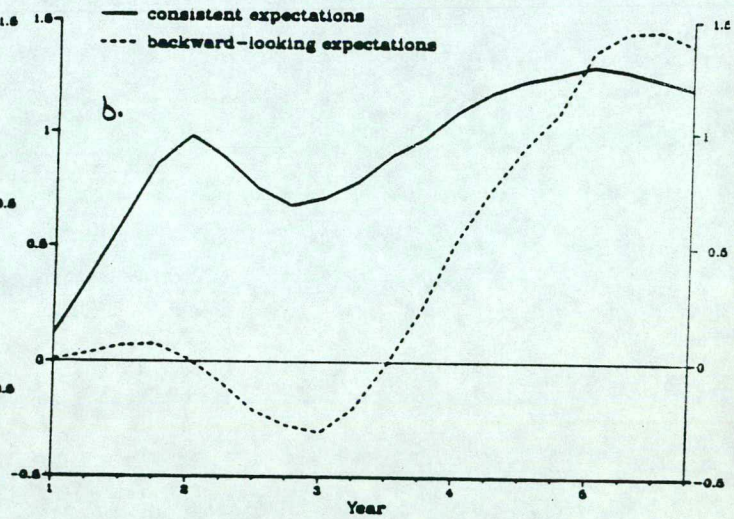
CHART 8

Change in "stance": balanced expansion

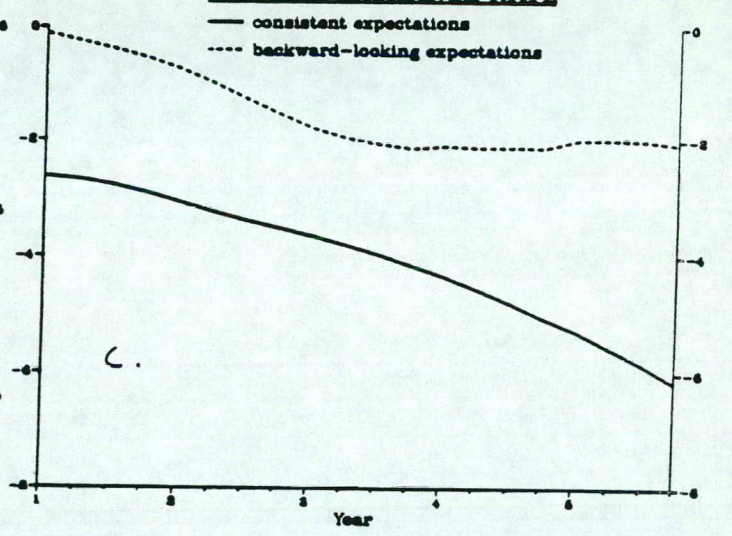
GDP



RPI INFLATION



NOMINAL EXCHANGE RATE



74. On the other hand, the contrast between the flexibility of the exchange rate and the stickiness of domestic costs tends to be much less significant when expectations are backward-looking. In these circumstances, the exchange rate will only reflect a change in inflationary pressure as and when that change becomes evident - either in domestic inflation itself or in indicators of inflationary pressure such as monetary growth, or a deteriorating current account.

75. This is evident in Charts 8b and 8c, where the assumption of backward-looking expectations rules out any initial jump in the exchange rate, and as a result the effect on inflation takes almost four years to "catch up" with that under consistent expectations.[21] The counterpart to this, of course, is that output rises by much more, and stays higher for longer, than when expectations are consistent (see Chart 8a).

76. Turning to the effects of a change in policy mix, it is remarkable, by contrast, how little difference the expectations assumption makes - particularly in the first three years or so of the simulation. The main reason for this is that a change in policy mix which is eventually reversed does not imply a change in either the equilibrium price level or its rate of change. In principle, the exchange rate ought not to be much affected by the difference between agents "looking forward" and seeing no change, and them not looking forward at all. In the short term, however, the main influence in both cases is that of short term interest rates, the effects on which are shown in Chart 9.

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21 In the steady state, most expectations formation mechanisms will produce convergence between actual and expected values, so that these differences will disappear. In practice, the backward-looking expectations equations in the Treasury model may not converge on consistent expectations because there is nothing to ensure that the equilibrium exchange rate (RXQ) will restore basic balance.

Changes in short term interest rates

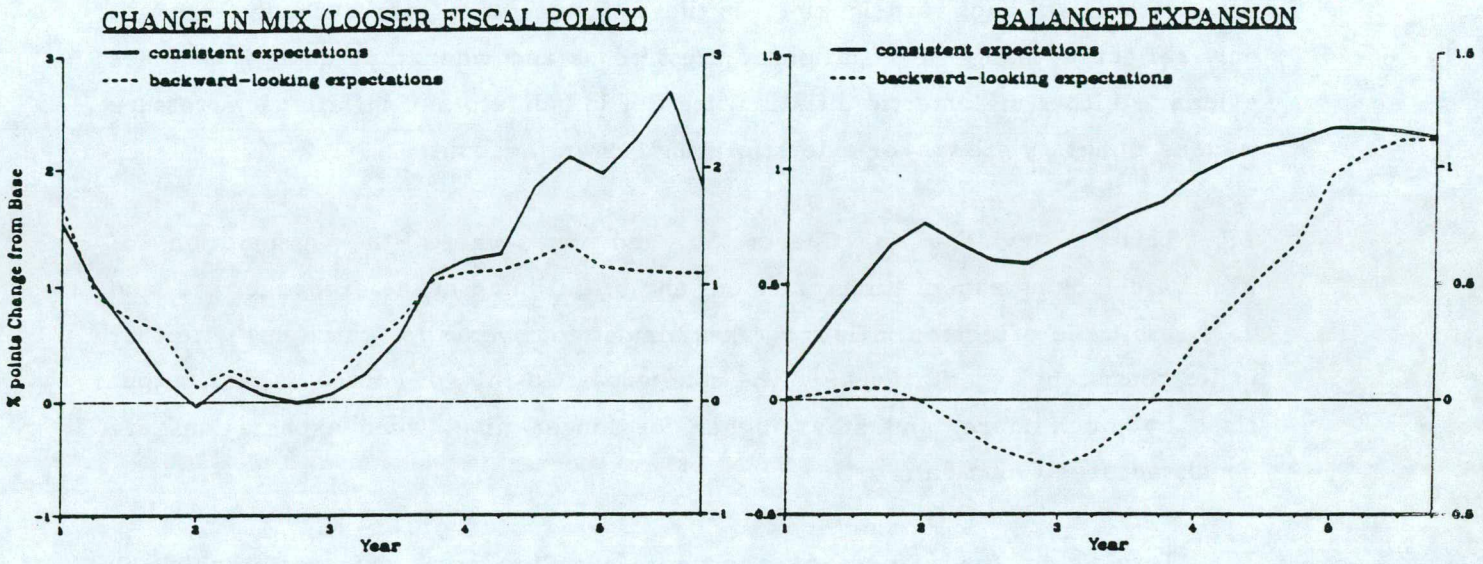

CHART 9

77. With backward-looking expectations, the model equation implies that the exchange rate path more or less matches that of short term interest rates, giving the U-shaped response shown in Chart 7c. With consistent expectations the nature of the link between the exchange rate and interest rates is quite different - depending, as explained earlier, on the interest parity condition plus a risk premium. Over the first three years of the simulation it coincidentally implies the same shape of exchange rate path: higher, but falling, interest rates mean an exchange rate depreciating, but at a decreasing rate. Beyond year 3, however, the similarity breaks down. Under backward looking expectations, the exchange rate rises in line with interest rates; under consistent expectations, it must depreciate and at an increasing rate.

78. Charts 7a and 7b bear out the now familiar result that effects on output and inflation correspond closely to differences in the exchange rate response. Up to the end of year 3, the differences under the two expectations assumptions are negligible. Thereafter, consistent expectations imply a lower exchange rate, and hence higher inflation and lower output. The discussion in the previous paragraph, however, suggests that these effects will be critically dependent upon the profile of interest rate changes in the simulation. Unlike the case of a change in overall policy stance, therefore - where the clear conclusion emerged that forward-looking expectations tend to reduce the output effects of changing

aggregate demand - the influence of differing expectations regimes for a change in policy mix will be highly model-dependent.

"Imperfect Foresight"

79. The assumption that private sector expectations are forward-looking, and based on an economic model similar to that of the policy maker, can be justified to the extent that the two sets of participants share a common information set. But when it comes to the policymakers' intentions with regard to the setting of policy, the private sector is at a disadvantage in two respects;

i. even if, as we have assumed, policy intentions are made public, agents cannot be sure that those intentions are genuine, or that the intended policy can in fact be implemented;

ii. if the announced policy implies a fiscal-monetary mix which is unsustainable from the outset, the private sector has to make some prediction as to how and when policy will be re-aligned. Their job is made more difficult by the fact that policy makers would not normally announce re-alignment in advance.

80. In both cases, the implication is that the private sector, despite having the "right" model with which to assess policy changes, may nevertheless form inconsistent expectations to the extent that their assumptions about policy turn out to be incorrect.

81. Consider first the case where a sustainable policy change is announced but, initially, is not believed.[22] The classic example is a policy change which is "time inconsistent", ie where the private sector suspends belief because they know that the authorities have an incentive to renege. In these circumstances, it is possible that the policy will only gain credibility as and when it is seen to have been implemented.

82. The authorities are assumed to announce and implement a sustained one per cent reduction in the growth rate of money GDP. The private sector initially (ie in the first quarter) discounts the announcement altogether, leaving its forecasts of output, inflation, exchange rates and so on unchanged. Over the subsequent two years, however, it gradually updates its forecasts, giving an

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22 The effects would be similar for an announced policy change which was believed but not implemented, ie if the authorities "cheat".

increasing weight to the government's initial announcement, so that by the beginning of year 3 the policy change is fully credible.[23]

83. Chart 10 compares the effects of this scenario ("learning") with one in which the same policy change is believed from the outset, ie where expectations are consistent (as in table A, but with signs reversed). Not surprisingly, the expectational variables - the exchange rate and the long term interest rate - respond quite differently in the two cases, until full credibility is established. More surprising, perhaps, given that convergence is relatively quick, is the extent to which the effects on output and inflation differ:

- with consistent expectations, inflation is reduced by one per cent within 12 months (though it cycles somewhat thereafter); with less-than-full credibility, the same reduction takes almost three years;
- the output cost of reducing inflation is increased significantly when expectations take time to respond; at its trough, the reduction in output is almost twice as big as under consistent expectations.

84. The explanation for this lies mainly in the fact that the exchange rate tends to be higher the greater the credibility of the government's commitment to reducing money GDP growth (and, by implication, the rate of inflation). In the "learning" case, the exchange rate is therefore lower for a year or so than if the policy change had been fully credible from the start. This also means that income taxes have to be raised by more to deliver the same reduction in money GDP growth. The combination of a lower exchange rate and an adverse retention ratio effect on earnings growth slows down the transition to lower inflation, with a correspondingly bigger (temporary) output loss. Associated with this is a greater degree of undershooting in the inflation rate from about year 4 onwards, as the effects of recession on wage growth and other domestic costs combine with those of revised expectations in the foreign exchange market.

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23 For simulation purposes, this process is assumed to be linear; see Cooper and Young (1987) for a fuller description of the methodology.

Effects of a 1 per cent reduction in money GDP growth

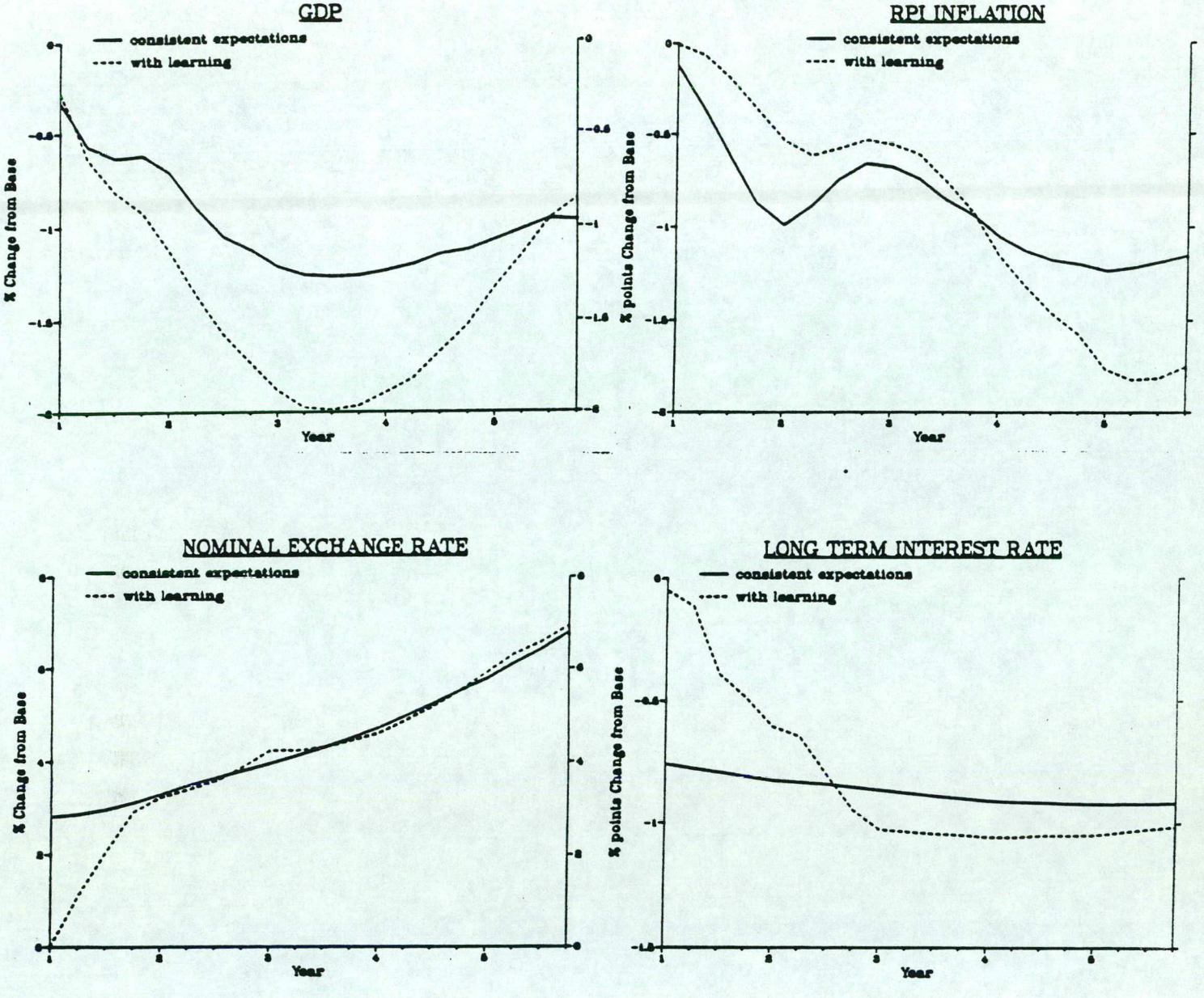

CHART 10

85. The second case in which actual and expected policy changes may diverge is when the initial policy change has to be amended at some point in the future, because it incorporates an unsustainable shift in policy mix. So far, we have assumed that;

i agents anticipate that policy re-alignment will occur after five years;

ii. they expect that it will take the form of a reversion to the same mix of policy as on the base, with no further change in overall policy stance;

iii. agents' expectations are fully realized.

86. Clearly, full reversal after five years is only one of a whole range of options available to the authorities (the only restriction being that the original mix of policy must eventually be restored). In practice the best that agents can do is to attach subjective probabilities to the various options, deriving expected values for the instruments of policy, and then construct an economic forecast based on those expected values. As time progresses, some options will appear more or less likely (and some may be eliminated altogether), so that agents will be continually updating their forecasts. In the event, of course, these forecasts may or may not be realized.

87. These problems, and some suggestions for dealing with them, are discussed in more detail in Cooper (1987). For our purposes, it is sufficient to note that uncertainty about policy re-alignment means that the effects of a given change in policy mix can differ quite substantially, depending on how and when agents expect the authorities to deal with the policy's inherent unsustainability.[24]

88. To illustrate this, consider again the case of a five year fiscal expansion which is offset in its effects on money GDP by higher real interest rates. Suppose that, rather than expecting this to be resolved by a reversal of the original fiscal expansion, agents anticipate instead that the PSBR ratio will remain one per cent higher indefinitely, and that from year 6 onwards this will be accommodated by faster growth in money GDP.[25]

89. The result is that, even though over the initial period both the stance and the mix of policy are exactly the same in the two scenarios, the expectation that the higher PSBR will eventually be accommodated rather than reversed is sufficient to reduce the temporary output gains from the change in mix, with correspondingly higher inflation (see Chart 11). The medium for this is a lower exchange rate. Fiscal expansion still implies an initial upward jump in the exchange rate, but the anticipation of a higher long run inflation rate reduces the size of that jump (fractionally) and implies a faster rate of depreciation thereafter - the fall in the exchange rate accelerating as the expected relaxation of policy approaches.

90. The difference in the size of the initial upward jump in the exchange rate is small because currency markets are assumed to attach some weight to contemporaneous current account imbalances (see paragraph 34). These imbalances are, initially, very similar in both cases. If, however, domestic and foreign assets were regarded as perfect substitutes - so that the exchange rate was determined solely by its expected long run equilibrium value and the path for short term interest rates - more of the eventual fall in the exchange rate would be brought forward[26], implying a smaller upward jump (or possibly even a downward jump). This of course would reduce the short run increase in output still further.

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24 In practice, of course, agents may anticipate re-alignment even when a policy is theoretically sustainable - for example, on account of political factors (the electoral cycle etc). This possibility is not considered here.

25 ie real interest rates return to base levels.

26 In technical terms the forward-looking root in the exchange rate equation would be increased.

Effects of 1 per cent increase in the PSBR/GDP ratio with unchanged money GDP

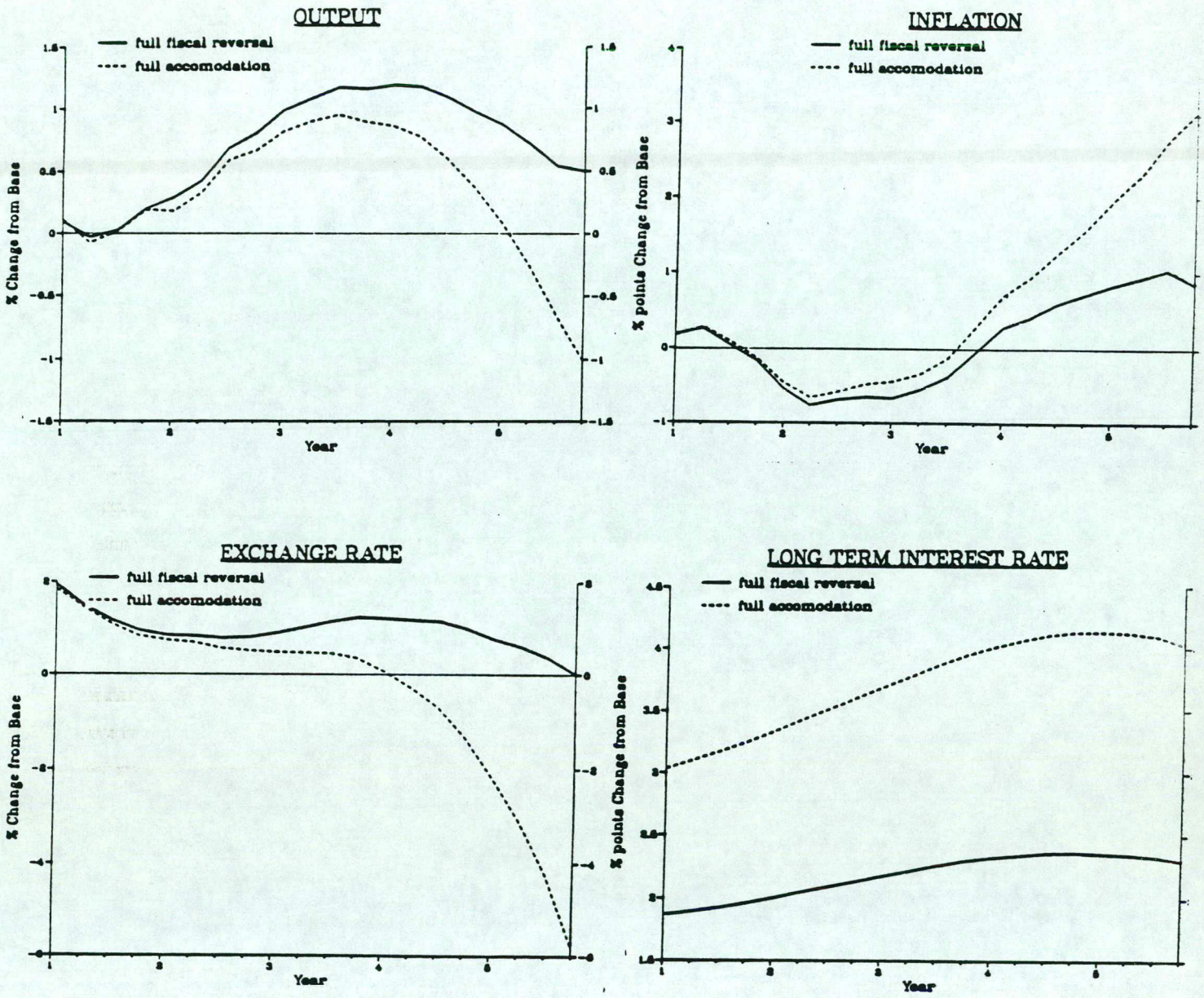

CHART 11

91. To summarize, we can say that the rise in the exchange rate, and the associated (temporary) output gains from a shift towards looser fiscal policy and tighter monetary policy will tend to be smaller:

a. the greater the expectation that the fiscal expansion will eventually be accommodated,

b. the sooner that accommodation is expected to occur, and

c. if monetary accommodation is expected, the greater the degree of forward-lookingness in the foreign exchange markets.

92. The effect on long term interest rates is less clear cut; they will tend to be higher the greater the degree of expected accommodation (because of higher expected inflation); but will also rise by more the longer the period of non-accommodation because the debt-income ratio rises by more.[27] In Chart 11, of course, re-alignment occurs at the same point in both cases, and so anticipated accommodation unambiguously generates higher long term interest rates (one implication of which, harking back to the discussion in section III, is that relative capital - labour costs rise, and employment gains are therefore less affected than output gains by changes in expectations).

93. Our intention in this section has been to echo the message of the theoretical literature, that expectations are crucially important in determining the effects of changes in macroeconomic policy. The simulation results confirm that;

- for a change in overall policy stance, the effects on output are reduced (and on inflation, increased) if the change is announced, if it is believed and if markets adjust their forecasts rationally with the benefit of full information. The corollary is that if expectations are relatively inert, if policy changes are not credible, or if the authorities cheat, more of any given change in demand will be reflected in a temporary change in real output, less in inflation.

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27 Virtually by definition, a balanced policy (ie with accommodation) implies a stable debt-income ratio; the changing debt-income ratio generated by fiscal expansion with unchanged money GDP is one reason why such a policy may not be sustainable.

- for changes in policy mix, the most important factor is the extent to which markets anticipate that a change in mix heralds some future change in stance: so long as the "fixed nominal framework" is intact, and expected to remain so, the backward-lookingness of expectations (or otherwise) is of much less significance.[28]

VI EFFECTS OF PARAMETER CHANGES IN SOME KEY MODEL RELATIONSHIPS

94. The two main issues dealt with so far in this paper - the policy framework and expectations - can both be represented as modelling issues, in the sense that they involve substituting one model relationship, or set of relationships, for another.[29] In this penultimate section, we consider the effects of amending a number of other relationships, concentrating on those which are most likely to have a major influence on overall model properties.

95. It should not be inferred from this that we believe the equations in question to be mis-specified. Nor do the amendments we make necessarily have any empirical justification - though, where possible, we try to keep parameter changes within 95 per cent confidence intervals, as originally estimated. The point of the exercise is to acknowledge that behavioural relationships are measured with error (sampling error, at least), and that a complete analysis of policy changes should include an assessment as to how dependent the central estimates are on particular parameter values. The weaker the empirical evidence for an estimated relationship is, the more cautious one has to be about simulation results which rely heavily on the parameters of that relationship.[30]

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28 Intuitively, this is because with fixed money GDP the long run levels of output and prices are effectively pinned down; it is only when policy involves significant future changes in these variables that forward-looking expectations are of fundamental importance.

29 In the case of the policy framework, we are mostly replacing exogenous instruments with exogenous targets (so that the instruments are effectively endogenized).

30 Similarly, the greater the influence of a relationship on overall model properties, the more effort one should invest in trying to identify its "true" parameters.

96. We therefore look again at the effects of a sustained increase in money GDP growth, using a balanced combination of fiscal and monetary expansion, when:

i. in the earnings equation, pressure-of-demand effects are twice as powerful as in the Treasury model,

ii. the retention ratio effect on earnings is eliminated,

iii. trade volumes are twice as responsive to changes in competitiveness and

iv. the degree of international capital mobility (or the degree of substitutability between domestic and foreign assets) is reduced.

Earnings

97. The equation which determines the level of earnings in the manufacturing sector (and hence, by assumption, all other earnings in the economy) is one of the most important in the model. In addition to its role in the inflation process, the behaviour of earnings also effects international competitiveness (the real exchange rate) and the equilibrium level of employment.

98. Of those factors influencing real earnings, two have been alluded to already in this paper: the level of unemployment and the retention ratio. The presence of a term in unemployment in the earnings equation points towards (though does not guarantee) a vertical long run Phillips curve - the position of which (ie the NAIRU) is determined by, amongst other things, the level of the retention ratio.

99. Consider first the influence of unemployment. The coefficient on the unemployment term in the earnings equation is fairly small - a one percentage point rise in unemployment, from current levels[31], reduces real earnings by only about ½ per cent in the long run. This suggests that pressure-of-demand in the labour market contributes little to the process by which the economy adjusts to exogenous shocks. Unsurprising though this may be in the light of historical experience, it is nevertheless worth considering how much more or less adjustment would be implied by an incremental change to the "pressure-of-demand" term in the earnings equation.

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31 The term in unemployment is non-linear, relating the log of earnings to the log of the unemployment rate, and so the initial level of unemployment affects the elasticity.

1 per cent faster money GDP growth: more "responsive" labour market

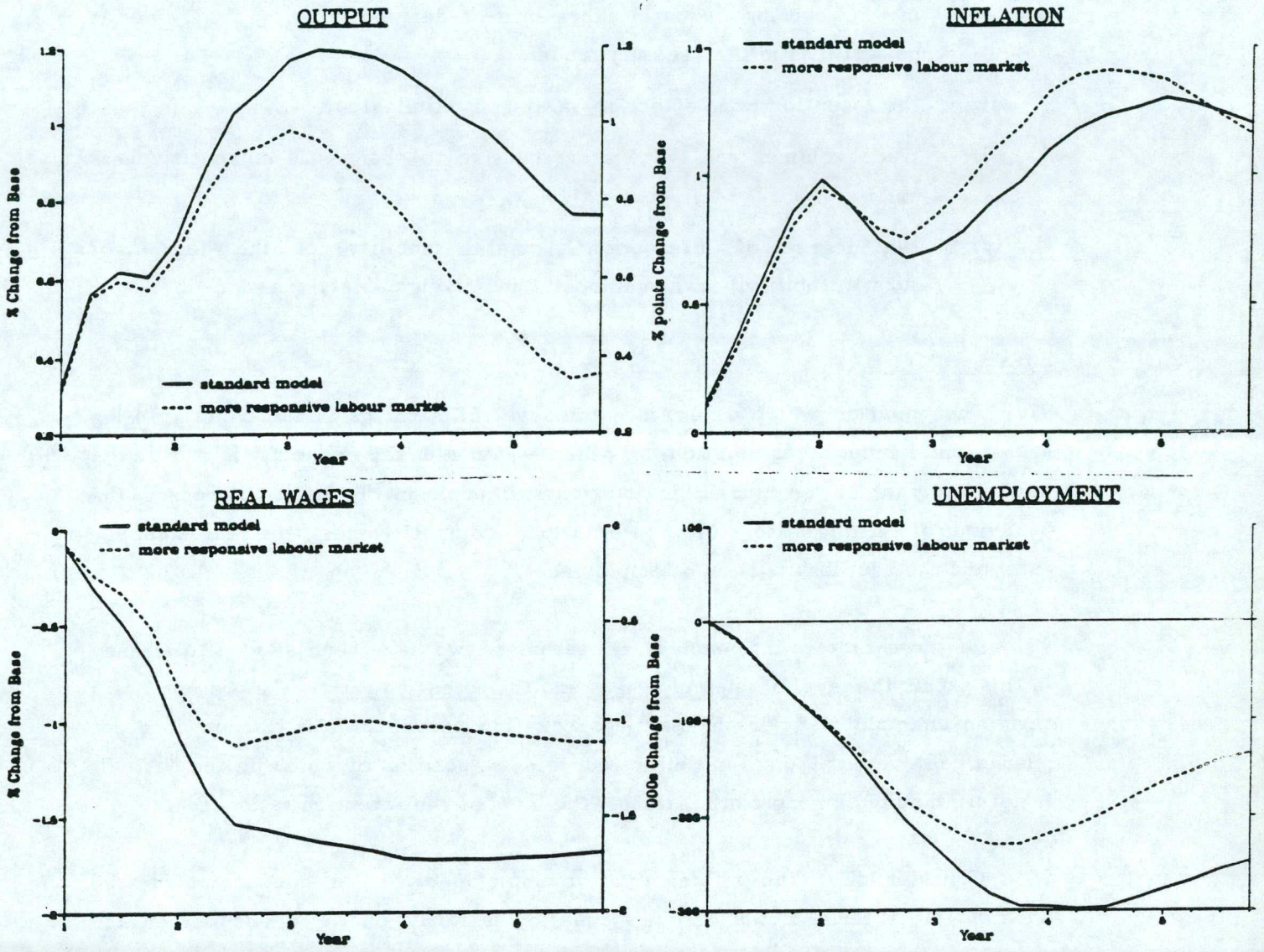

CHART 12

100. In fact, the estimated standard error on this term (see Rowlatt (1986)) is sufficient to allow us to double its coefficient without exceeding the 95 per cent confidence bounds - implying a significantly steeper short run Phillips curve. The impact of this on the effects of a balanced expansion are shown in Chart 12.

101. As we would expect, the increase in aggregate demand translates more quickly into higher inflation the greater the response of earnings to lower unemployment. The peak increase in output is reduced by about 20 per cent, and the peak reduction in unemployment by almost one quarter. The effect on unemployment is greater than that on output precisely because the emphasis is on improved labour market flexibility; faster adjustment in the economy as a whole is augmented by faster adjustment in the labour market relative to other markets.

102. The second variant we consider is one in which real earnings are unaffected by changes in the retention ratio. (Recall from section IV that balanced expansion involved a real reduction in personal income tax, and that the feed-through from this to lower wage demands was one reason for the improvement in the output - inflation split). Again, this variant can be justified empirically, in as much as the data are unable to distinguish, at the 5 per cent level, between the model coefficient and a coefficient of zero.

103. Chart 13 shows how the absence of a retention ratio effect reduces the peak increase in output resulting from faster money GDP growth by roughly 50 per cent. Indeed, within less than five years, the real output effect has disappeared altogether - whereas in our "main case" (ie including the retention ratio effect) crowding out is only half-complete by this stage.

104. Without the retention ratio effect, differences between the effects of income tax cuts and public spending increases are likely to be much smaller, and can be attributed entirely to different short-run multiplier effects, as described in section III.

105. Note that we could, in principle, take out some of the microeconomic effects of changes in other types of tax (analogous to eliminating the retention ratio effect). In all cases, the result will be convergence in the effects of a given change in fiscal stance using different fiscal instruments.

1 per cent faster money GDP growth: no retention ratio effect

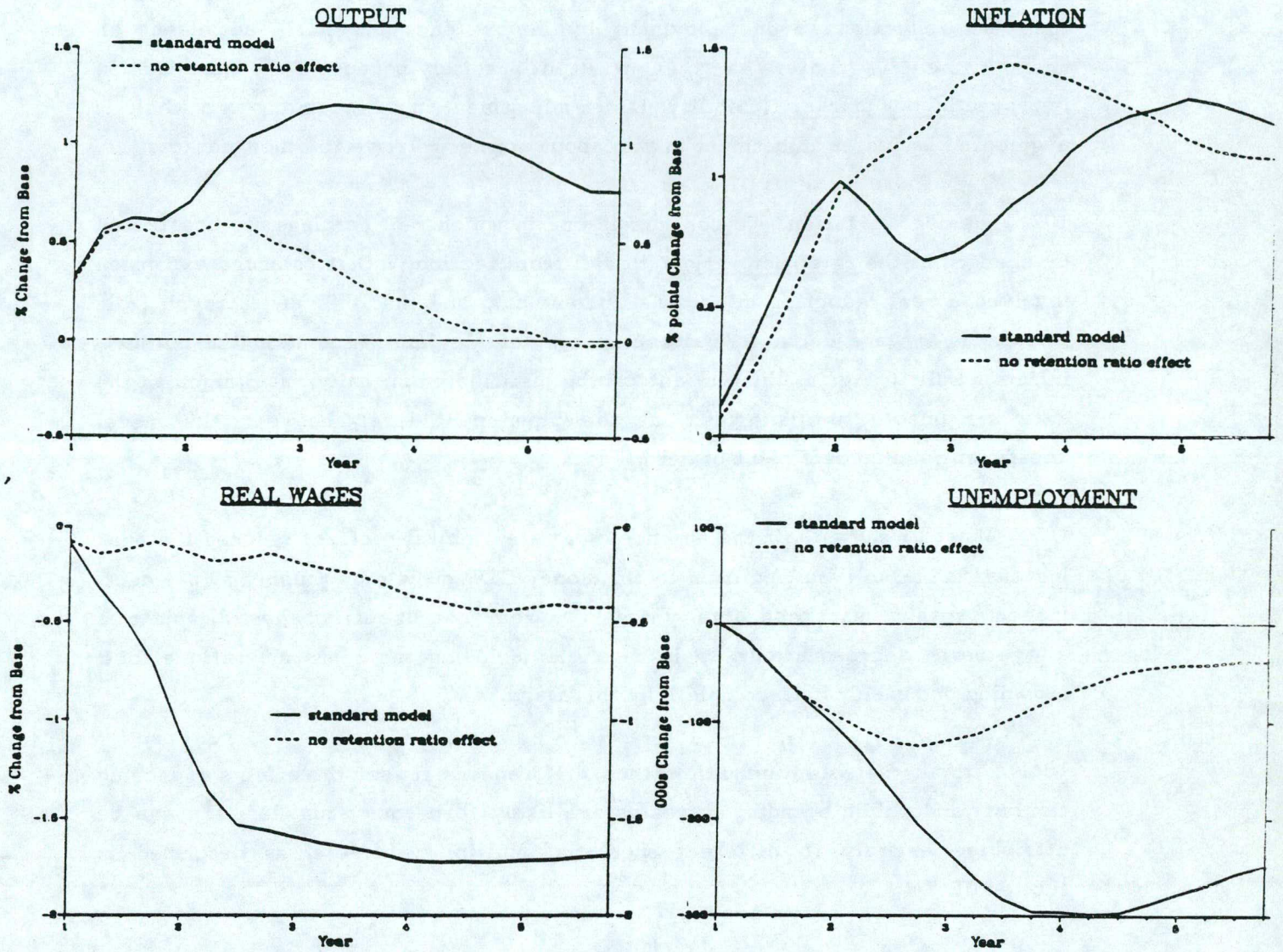

CHART 13

Trade Volumes

106. Sluggishness in the response of domestic costs to changes in nominal exchange rates can mean that even balanced changes in the growth of nominal demand (which, as we have seen, do not necessarily imply any long run changes in real variables) can lead to prolonged changes in international competitiveness. One factor affecting the output-inflation split over this period will therefore be the extent to which, when nominal demand accelerates and the exchange rate falls, domestic producers can take advantage of the temporary improvement in cost competitiveness to raise their output. This applies to firms competing in domestic markets, against imports, as well as those exporting to world markets.

1 per cent faster money GDP growth: trade elasticities doubled

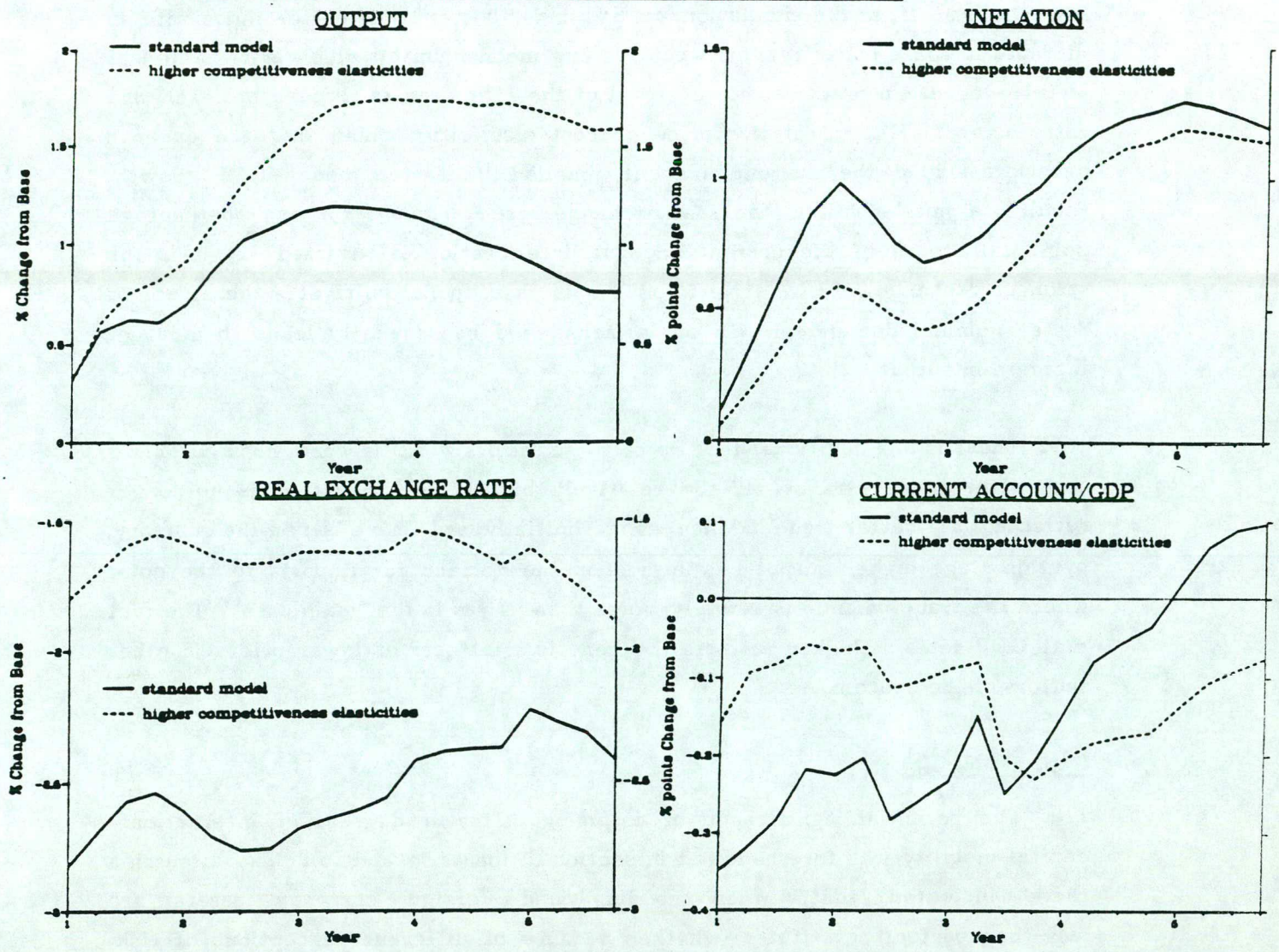

CHART 14

107. Chart 14 compares the effects of faster money GDP growth using the standard model, with those in which the responsiveness of traded volumes of goods and services to changes in competitiveness is doubled[32]. (This could be rationalised by an assumption that the upturn in demand comes at a time of unusually low capacity utilisation).

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32 In the Treasury model, cost or price competitiveness affects exports and imports of manufactures, exports and imports of services, and exports of non-manufactures. Although emipircal research has often failed to find well-determined competitiveness effects, we cannot be sure that doubling of coefficients is necessarily data-admissable, since in the Treasury model not all of the relevant coefficients are freely-estimated.

108. The additional increase in output which results from improved trade performance has to be accommodated, within the given path for money GDP, by lower prices. If, in the simulation, we had linked better trade performance with an increase in spare capacity, this would be one mechanism by which price increases were reduced. In practice, however, all of the effect works through the exchange rate instead. Higher relative price or cost elasticities mean that the ex ante deterioration in the current account, implied by faster money GDP growth, requires a smaller fall in the real exchange rate - because for each percentage point fall, more of the current account deterioration is reversed[33]. It is the stronger exchange rate (relative to our "main case") which mitigates the effect of faster nominal demand growth on inflation, and consequently leads to a larger increase in output.

109. There is one additional feature of these results which is worth noting. This is that after four years or so, the relatively bigger rise in output is no longer reflected in a better trade balance, as it is initially (see Chart 14); on the contrary, by this stage higher output has pushed up the demand for imports to the point where the trade balance is actually worse than it was in the "main case". The fact that GDP remains higher reflects the beneficial effects of lower prices in other sectors of the economy.

Capital Mobility

110. The potential significance of assuming different degrees of international capital mobility was foreshadowed in section III (paras 34 and 35). The discussion there indicated that, when sterling and foreign currency assets are less-than-perfect substitutes (whether because of different perceptions of risk, institutional constraints or whatever), international investors will require changes in relative rates of return in order to induce them to finance larger or smaller current account deficits. When UK real interest rates are fixed relative to the rest of the world, as they are in our balanced expansion case, changing differentials must take the form of an expected change in the rate of exchange rate depreciation.

111. One implication of this is that the importance of capital mobility will depend upon how great is the impact of a change in policy on the current account. The results in Table A of Section IV show that the current account effects of a

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33 Hence, also, the degree of expected real exchange appreciation which is needed to generate offsetting capital inflows is reduced. On both counts, the initial downward jump in the exchange rate will be smaller.

balanced increase in money GDP growth are fairly modest (¼ per cent of GDP or less in the short term, falling to around zero after four or five years). It is therefore no surprise that in these circumstances, as Chart 15 shows, quite a large reduction[34] in the degree of capital mobility has a comparatively small effect on the economy as a whole.

1 per cent faster money GDP growth: lower capital mobility

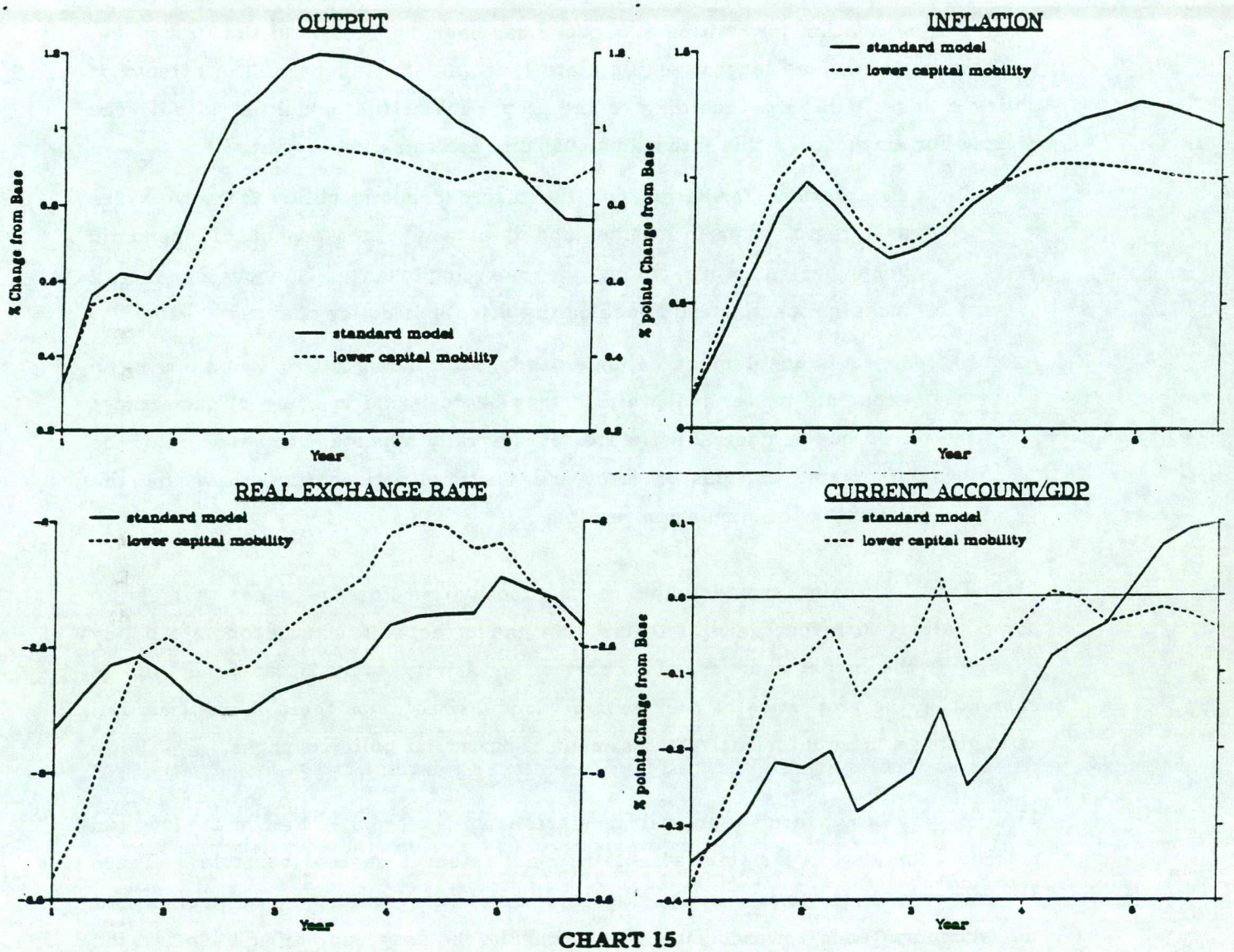

CHART 15

34 The (imposed) coefficient on the current balance in the exchange rate equation was increased ten-fold. It is difficult to know on what criterion a change to this coefficient could be described as "large", but we have found that a ten-fold increase significantly reduces the output effect of a change in policy mix (where current account effects are bigger).

112. The exchange rate initially falls by more, because agents anticipate that it will then appreciate more quickly, so generating the required increase in the relative return on sterling assets. This brings forward the inflation effect of faster demand growth, implying a correspondingly smaller increase in output. Chart 15 also demonstrates the fairly sensible result that the greater the cost of financing current account imbalances, the smaller those imbalances tend to be.

VII CONCLUSIONS

113. The motivation for writing this paper has been two-fold. In the first place, we have gone to some lengths to illustrate that any assessment of the effects of policy changes will vary according to the properties of the model employed. The reasons for emphasising this rather obvious point are to establish that:

i. expectations formation and the macroeconomic policy framework are as integral a part of "the model" as any other aspect of economic behaviour, and are among the most important influences on overall model properties and hence on the effects of policy changes;

ii. there is an element of uncertainty surrounding all relationships in an economic model and, while it may be desirable in some circumstances to focus on central estimates, it is equally important to be aware of the associated margins of error and the implications these have for the reliability of simulation results.

114. This last point provides the second motivation for the paper, namely to assess, albeit in rather general terms, how the effects of macroeconomic policy change as the model changes. This sort of sensitivity analysis can be helpful in elucidating the properties of the "central" model (insofar as there is one), as well as in giving a more informative assessment of particular policy changes.

115. In very broad terms, our analysis starts from the premise that in the long run macroeconomic policy mainly affects nominal rather than real variables. There are two reasons for this. Firstly, the structure of the Treasury model implies that the economy tends towards market clearing in the long run, though clearly the process of adjustment can be long and drawn out. Secondly, aggregate supply in the long run is largely independent of changes in the level or rate of growth of aggregate demand. It is recognised that in practice there may be factors which

violate this independence (for example, to the extent that the capital stock and real balances may be affected by changes in macroeconomic policy). But we argue that, in the Treasury model at least, these factors are either absent or quantitatively unimportant.

116. From this we conclude that the short run effects of macroeconomic policy on output, employment and other real variables derive mainly from the tendency for prices to adjust only with a lag, and for different markets in the economy to adjust at different speeds - wages tending to lag behind goods prices, and domestic goods prices lagging behind changes in the exchange rate. It is the consequent changes in relative prices (especially the real wage, the real exchange rate and the real interest rate) which generate real effects.

117. One change in output which is not attributable to adjustment lags comes about because of the response of real wages to a change in personal income tax (the retention ratio effect). But here it is useful to distinguish between the macroeconomic policy change, ie the change in fiscal stance, for which the preceding analysis applies, and the microeconomic policy change, which comes about because lower income tax reduces the wedge between the real product wage and the real consumption wage. It is this microeconomic effect which accounts for much of the difference between the results of changing the fiscal-monetary mix using lower income tax as opposed to higher public expenditure. Similar considerations would apply in the case of changes in other sorts of tax; for example VAT or NICs.

118. Given the significance of the adjustment process, it is not surprising that expectations formation is also of crucial importance - since the principal effect of different expectations regimes is to speed up or slow down the response of prices (including exchange rates and interest rates) to changes in policy, both current and future. The more forward-looking (and accurate) expectations are, the smaller are the effects of changes in macroeconomic policy on output and employment - essentially because relative prices adjust more quickly to offset the direct effects of the initial change in policy.

119. In circumstances where there are no direct effects on the supply side, we have shown how macroeconomic policy can raise output in the short term in one of two ways. The first involves a loosening of the stance of fiscal policy, offsetting any effects on money GDP by raising interest rates. As a strategy, this has a number of drawbacks:

- it is unsustainable, and will typically imply, at some point in the future, higher unemployment, higher inflation or both;
- it relies for its effectiveness on a higher exchange rate (thereby temporarily reducing inflation and raising real national income); as such, it may fail, either if higher deficits cause the financial markets to lose confidence in the authorities' medium term commitment against inflation, or if other countries refuse to accept a deterioration in their terms of trade and so alter the mix of their policies in line with the UK;
- it will generally involve a reduction in national wealth, including a rise in net indebtedness to the rest if the world.

120. The second possible strategy is to use a given mix of fiscal and monetary policy to raise the growth rate of nominal GDP permanently. This works mainly by depressing real wages (because wages tend to lag behind prices) and will be less effective the quicker wage bargainers catch on to the revised stance of policy. As in the case of a change in policy mix, the long run effects on output are likely to be very small, and could well be adverse. The strategy's main legacy is a permanently higher rate of inflation.

121. The recognition that the effects of macroeconomic policy derive largely from market imperfections provides a perspective for the section of the paper which deals with model variants. Apart from the retention ratio effect - which, as we have said, is a special case - the variants each serve to highlight a particular aspect of this approach. We show that:

- the quicker the response of the labour market (ie wage rates) to changes in excess demand, the smaller the real effects of changes in policy stance;
- the greater the responsiveness of the economy to changes in relative prices (eg trade volumes responding to changes in the real exchange rate), the larger the effect of macroeconomic policy on output;

- and that, in a world of imperfect markets, "second-best" situations can arise; thus, when an increase in demand causes a deterioration in the current account (because of rigidities in domestic supply), a lower degree of substitutability between sterling and foreign currency assets may actually reduce the real effects of that demand increase (intuitively, because the additional cost of financing the deficit forces more adjustment in domestic markets).

122. Needless to say, the variants reported in this paper form only a small sample out of a potentially very large population. In practice, the circumstances in which a policy change is made, as well as the nature of the change itself, will suggest which variants are most appropriate. And, in some cases, this may affect not only the margins of error attached to a particular central estimate, but also the central estimate itself (as the Lucas critique implies).

123. If we were to single out any one theme, or message, from this paper, it would be that the use of macroeconomic models for policy analysis is unlikely ever to be a purely mechanical process. Moreover, the areas where judgement is most needed - particularly in the specification of the policy environment and the treatment of expectations - have been shown to be amongst the most important in determining the results of model-based policy analysis. This suggests that future research could usefully be directed towards giving these judgements a sound theoretical and empirical basis, making them at the same time more sophisticated and less arbitrary.

H BREDENKAMP
6 **October1987**

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ANNEX I

TABLE 1

CHANGES IN POLICY MIX
Increase of one percentage point in
PSBR/GDP ratio for 5 years:
non-accommodating monetary policy

FISCAL INSTRUMENT	Personal Income Tax			General Government Investment		
INTEREST RATE POLICY	Optimal money GDP control	Fixed MO	Feedback rule	Optimal money GDP control	Fixed MO	Feedback rule
% change from base in:						
REAL GDP						
Year 1	+.1	0	0	+.5	+1.2	+.8
Year 2	+.6	+.4	+.4	+.5	+1.0	+.4
Year 3	+1.1	+.8	+1.1	+.3	+.8	+.3
Year 4	+1.1	+1.0	+1.2	-.2	+.2	-.2
Year 5	+.7	+.9	+.8	-1.0	-.5	-.8
MONEY GDP						
Year 1	+.1	0	0	+.2	+.9	+.4
Year 2	0	-.2	-.1	0	+1.3	0
Year 3	0	-.3	0	0	+2.2	+.2
Year 4	0	+.2	+.2	0	+2.6	+.2
Year 5	0	+1.0	+.3	0	+2.9	+.3
RPI INFLATION						
Year 1	+.1	+.1	+.1	+.1	+.1	0
Year 2	-.7	-.7	-.7	-.3	+.8	0
Year 3	-.4	-.1	-.3	+.3	+1.2	+.3
Year 4	+.5	+.7	+.5	+1.0	+1.3	+.8
Year 5	+.9	+1.2	+.9	+1.2	+.8	+1.0
REAL EARNINGS						
Year 1	0	+.1	+.1	+.6	+.3	+.6
Year 2	-.4	-.4	-.4	+.9	+.4	+.8
Year 3	-.7	-.7	-.7	+.4	0	+.3
Year 4	-.8	-.9	-.8	+.2	-.4	+.1
Year 5	-1.0	-1.3	-1.1	-.2	-.6	-.2
REAL EXCHANGE RATE						
Year 1	+1.4	+1.7	+1.6	+2.7	0	+2.7
Year 2	+.2	0	0	+1.4	-.2	+1.1
Year 3	-.1	-.8	-.2	+.9	+.1	+1.0
Year 4	0	-1.2	-.2	+.7	+.5	+.8
Year 5	-.3	-1.2	-.1	+.1	+.8	+.6
S-T INTEREST RATES						
Year 1	+.9	+1.2	+1.2	+1.5	+.7	+1.5
Year 2	+.1	+.2	-.1	+1.0	+1.4	+.8
Year 3	+.5	+1.0	+.6	+1.4	+1.7	+1.5
Year 4	+1.6	+1.6	+1.4	+2.3	+2.1	+2.0
Year 5	+2.2	+2.0	+2.2	+2.5	+1.9	+2.5

TABLE 1 (Cont)

CHANGES IN POLICY MIX
Increase of one percentage point in
PSBR/GDP ratio for 5 years:
non-accommodating monetary policy

FISCAL INSTRUMENT	Personal Income Tax			General Government Investment		
INTEREST RATE POLICY	Optimal money GDP control	Fixed MO	Feedback rule	Optimal money GDP control	Fixed MO	Feedback rule
% change from base in:						
CURRENT ACCOUNT (£bn)						
Year 1	-.3	-.2	-.3	-1.0	-2.5	-1.8
Year 2	-2.1	-1.8	-1.8	-3.0	-3.1	-2.6
Year 3	-4.1	-3.4	-3.9	-3.9	-3.7	-3.8
Year 4	-4.4	-3.6	-4.3	-2.9	-2.8	-2.8
Year 5	-3.6	-3.4	-3.9	-.4	-1.0	-1.1

TABLE 2

DIFFERENT EXPECTATIONS ASSUMPTIONS

Increase of one percentage point in PSBR/GDP ratio for 5 years, via lower income tax: money GDP unchanged

	Consistent expectations: Fiscal shock reversed after 5 years	Consistent expectations: fiscal shock accommodated after 5 years	Backward-looking expectations
% change from base in:			
REAL GDP			
Year 1	+.1	+.1	+.1
Year 2	+.6	+.4	+.6
Year 3	+1.1	+.9	+1.1
Year 4	+1.1	+.7	+1.2
Year 5	+.7	-.5	+1.1
RPI INFLATION			
Year 1	+.1	+.1	+.2
Year 2	-.7	-.5	-.6
Year 3	-.4	-.2	-.4
Year 4	+.5	+1.1	+.2
Year 5	+.9	+2.6	+.1
REAL EARNINGS			
Year 1	0	0	-.1
Year 2	-.4	-.5	-.4
Year 3	-.7	-.8	-.6
Year 4	-.8	-1.1	-.5
Year 5	-1.0	-1.7	-.5
REAL EXCHANGE RATE			
Year 1	+1.4	+1.3	+1.2
Year 2	+.2	+.2	0
Year 3	-.1	-.5	-.1
Year 4	0	-1.2	+.6
Year 5	-.3	-3.4	+.9
S-T INTERST RATES			
Year 1	+.9	+.9	+1.0
Year 2	+.1	+.3	+.2
Year 3	+.5	+.9	+.6
Year 4	+1.6	+2.7	+1.2
Year 5	+2.2	+5.1	+1.1
CURRENT ACCOUNT (£bn)			
Year 1	-.3	-.2	-.4
Year 2	-2.1	-1.7	-2.2
Year 3	-4.1	-3.4	-4.0
Year 4	-4.4	-2.9	-4.4
Year 5	-3.6	+.5	-5.2

TABLE 2 (cont)

DIFFERENT EXPECTATIONS ASSUMPTIONS
"Balanced" one percentage point reduction in money GDP growth

	Consistent expectations	Backward-looking expectations	"Learning" (see para 82)
% change from base in:			
REAL GDP			
Year 1	-.5	-.6	-.7
Year 2	-.9	-1.7	-1.5
Year 3	-1.2	-2.9	-2.0
Year 4	-1.1	-3.4	-1.7
Year 5	-.8	-3.0	-1.1
RPI INFLATION			
Year 1	-.5	-.1	-.2
Year 2	-.8	+.1	-.6
Year 3	-.8	+.1	-.7
Year 4	-1.2	-.8	-1.4
Year 5	-1.3	-1.4	-1.8
REAL EARNINGS			
Year 1	+.4	+.1	+.2
Year 2	+1.4	+1.1	+1.6
Year 3	+1.7	+1.9	+2.2
Year 4	+1.9	+2.1	+2.2
Year 5	+1.9	+1.9	+2.1
REAL EXCHANGE RATE			
Year 1	+2.8	+.3	+1.6
Year 2	+2.9	+1.5	+3.5
Year 3	+2.9	+2.6	+3.8
Year 4	+2.7	+2.2	+3.3
Year 5	+2.7	+.8	+3.0
S-T INTEREST RATES			
Year 1	-.4	0	-.1
Year 2	-.7	+.1	-.4
Year 3	-.7	+.2	-.6
Year 4	-1.0	-.5	-1.1
Year 5	-1.1	-1.1	-1.6
CURRENT ACCOUNT (£bn)			
Year 1	+1.2	+1.6	+1.8
Year 2	+1.2	+4.8	+2.9
Year 3	+1.2	+8.3	+2.8
Year 4	+.5	+9.2	+1.4
Year 5	-.3	+8.4	-.6

TABLE 3

CHANGES TO KEY MODEL RELATIONSHIPS
"Balanced" one percentage point increase in money GDP growth

	Standard model	Steeper short-run Phillips curve	No retention ratio effect	Higher competitiveness elasticities	Lower capital mobility
% change from base in:					
REAL GDP					
Year 1	+.5	+.5	+.5	+.6	+.5
Year 2	+.9	+.8	+.6	+1.2	+.8
Year 3	+1.2	+.9	+.3	+1.7	+.9
Year 4	+1.1	+.6	+.1	+1.7	+.9
Year 5	+.8	+.4	0	+1.6	+.9
RPI INFLATION					
Year 1	+.5	+.5	+.4	+.3	+.6
Year 2	+.8	+.8	+1.1	+.5	+.9
Year 3	+.8	+1.0	+1.4	+.6	+.9
Year 4	+1.2	+1.4	+1.3	+1.1	+1.1
Year 5	+1.3	+1.3	+1.1	+1.2	+1.0
REAL EARNINGS					
Year 1	-.4	-.3	-.1	-.2	-.5
Year 2	-1.4	-1.0	-.1	-.8	-1.4
Year 3	-1.7	-1.0	-.2	-1.0	-1.5
Year 4	-1.9	-1.1	-.4	-1.1	-1.7
Year 5	-1.9	-1.1	-.4	-1.2	-1.7
REAL EXCHANGE RATE					
Year 1	-2.8	-2.3	-1.6	-1.7	-3.0
Year 2	-2.9	-2.2	-1.2	-1.6	-2.5
Year 3	-2.9	-1.9	-1.0	-1.6	-2.3
Year 4	-2.7	-1.7	-1.1	-1.6	-2.1
Year 5	-2.7	-1.8	-1.3	-1.8	-2.3
S-T INTEREST RATES					
Year 1	+.4	+.4	+.3	+.2	+.5
Year 2	+.7	+.7	+.9	+.4	+.7
Year 3	+.7	+.9	+1.2	+.5	+.8
Year 4	+1.0	+1.2	+1.2	+.9	+1.0
Year 5	+1.1	+1.2	+1.1	+1.0	+1.0
CURRENT ACCOUNT (£bn)					
Year 1	-1.2	-1.2	-1.2	-.4	-1.0
Year 2	-1.2	-1.3	-1.3	-.4	-.5
Year 3	-1.2	-1.2	-.8	-.9	-.4
Year 4	-.5	-.4	-.2	-1.1	-.2
Year 5	+.3	+.5	+.5	-.6	-.2

ANNEX II

A MONETARY TARGET ACCOMMODATING A PERMANENT CHANGE IN NOMINAL INCOME

1. Suppose real GDP) is a function of real interest rates and some exogenous demand variable X;

$$y = - \alpha (r - \dot{p}) + x \qquad (1)$$

2. Suppose also that the money supply is fixed at $\bar{m}$, with demand for real balances depending on nominal interest rates and real income:

$$\bar{m} - p = - \beta r + \gamma y \qquad (2)$$

(all variables except r in logs)

3. Assume, finally, that inflation is determined by a simple Phillips curve relationship:

$$\dot{p} = \phi (y - y_n) \qquad (3)$$

4. Adopting the usual normalisation (the natural rate of output $y_n = 0$) and substituting (3) and (2) into (1) gives:

$$y = \frac{1}{\beta - \alpha\beta\phi + \alpha\gamma} \left[\alpha(\bar{m} - p) + \beta X\right] \qquad (4)$$

5. In the steady state, $y = y_n = 0$, so we can solve (4) for the long relationship between X and p:

$$p = \bar{m} + \frac{\beta}{\alpha} X \qquad (5)$$

6. This shows that, providing money demand is interest elastic (β is positive) and the interest elasticity of output is finite, a rise in X (in our case, due to fiscal expansion) will raise p permanently. Since money GDP is equal to y + p, this represents a permanent increase in money GDP.

7. Of course the result depends on being able to sustain a rise in X, with an offsetting increase in real (and hence nominal) interest rates. Only if r is permanently higher will velocity rise in the long run. Whether a sustained increase in real interest rates <u>is</u> possible depends on its more fundamental determinants, which are missing from this simple model, and indeed from the

Treasury model itself. We argue in the paper that the scope for changing real interest rates in the long term, relative to rates overseas, is extremely limited. The counterpart to this is that fiscal policy will not be able to generate a sustained change in X (recall that X is in real terms). Hence, as a long term proposition, the partially accommodating nature of a fixed monetary target is likely to be of little practical significance.

ANNEX III

ASSUMPTIONS ON CASH LIMITS, LOCAL AUTHORITY FINANCE AND EXPENDITURE, AND THE NATIONAL INSURANCE FUND

Cash Limits

1. In the first year of all simulations, the sum of central government expenditure on wages and salaries, procurement and investment is fixed in cash terms. If prices or earnings change in the simulation, the volume of procurement and investment is altered so as to maintain the aggregate cash plans; central government employment is not assumed to bear any of the adjustment.

2. After the first year, different assumptions are made depending on whether or not the simulation in question involves a change in the overall stance of policy. If it does not, the system described in the previous paragraph is maintained, except that only half of any divergence in prices is offset on volumes. If, however, the stance of policy accommodates permanently higher or lower inflation, no cash limits are applied beyond year 1.

Local authority finance

3. In all simulations, LA rates are assumed to be fixed in the first year, with market borrowing the residual source of finance. From the second year onwards, market borrowing is constrained to move in line with LAs' capital expenditure. Rates are then the residual source of finance. The aggregate exchequer grant to LAs is treated like all other cash-limited central government expenditure.

Local authority procurement

4. LA procurement is assumed to behave as if it were cash limited, except that, in addition, we assume that 20 per cent of any real change in the aggregate exchequer grant is matched by an equal and opposite change in the volume of procurement expenditure (the remaining 80 per cent being financed out of the rates).

National Insurance Fund

5. Any ex ante change in net inflows to the NIF is assumed to be offset by an across-the-board change in the rates of national insurance contribution (employers' and employees') from year 2 onwards. The changes in rates implied by the simulations in this paper are small - generally around one tenth of a percentage of point.

3767/060

RESTRICTED

BF to Abse 20/11 27

FROM: P D P BARNES
DATE: 26 October 1987

MR ODLING-SMEE

cc PS/Chancellor 2 pp
Sir T Burns
Mr Byatt
Mr C J Riley
Mr Mellis

TAX CUTS AND JOBS

Some simulations of the Treasury model denigrate the effectiveness of tax cuts in generating jobs and purport to show that infrastructure spending, for example, would be more effective in this respect.

2. The Economic Secretary is not aware of any simulation that accepts a common nominal income path constraint. He wonders whether it would be possible to use the Treasury model to compare the effect on jobs of say,

(a) a £1 billion reduction in revenues from basic income tax; and

(b) such combination of extra spending and interest rate changes as would produce the same path of nominal GDP.

Alex
These requests are terribly resource intensive. Is this EST's area?

RB

P D P BARNES
Private Secretary

RESTRICTED

FROM: P D P BARNES
DATE: 2 November 1987

MR ODLING-SMEE

cc PS/Chancellor
Sir T Burns
Mr Byatt
Mr Davies
Mr Melliss
Mr Bredenkamp

TAX CUTS AND JOBS

The Economic Secretary was grateful for your submission of 29 October.

2. The Economic Secretary thought that, at a first glance, Mr Bredenkamp's paper looked interesting and worth publishing.

PB

P D P BARNES
Private Secretary

RESTRICTED

Ecf

Mr Odling-Smee is doubtful, given the assumptions of the Treasury model, whether any fiscal expansion will have a long-run effect on unemployment. P 29/10

From: **J ODLING-SMEE**
29th October 1987

ECONOMIC SECRETARY

cc PS/Chancellor
Sir T Burns
Mr Byatt
Mr Davies
Mr Melliss
Mr Bredenkamp

TAX CUTS AND JOBS

You asked whether it would be possible to use the Treasury model to compare the effects on jobs of income tax cuts and increases in infrastructure expenditure, on the assumption that interest rates were changed to produce the same path for money GDP. I attach a chart which shows the percentage changes in employment when the PSBR is increased by 1 percentage point of GDP and interest rates are increased to ensure that money GDP remains unchanged. This shows that employment is higher in the first two years or so when expenditure is increased than when taxes are cut - essentially because a larger part of the tax cut leaks into saving and imports in the short run. Beyond the first two years, however, the increase in employment in the expenditure case is gradually eroded, while it rises further in the tax cut case.

2. In the longer term, the combination of fiscal expansion and tight monetary policy is unsustainable, as current US experience makes clear. The simulations shown here therefore assume that the increase in the PSBR is reversed after five years, and that financial markets correctly anticipate this from the start. In these circumstances, the long run effects on employment are likely to be small whatever the nature of the temporary fiscal expansion.

3. A combination of higher public expenditure and higher income tax which left the PSBR unchanged could in principle be sustained. In this case the Treasury model would predict lower employment in the long run, because of the adverse effects of higher income tax on wage costs. Conversely, a PSBR neutral combination of lower public investment and lower income tax would, according to the model, generate higher employment in the long run for given nominal income.

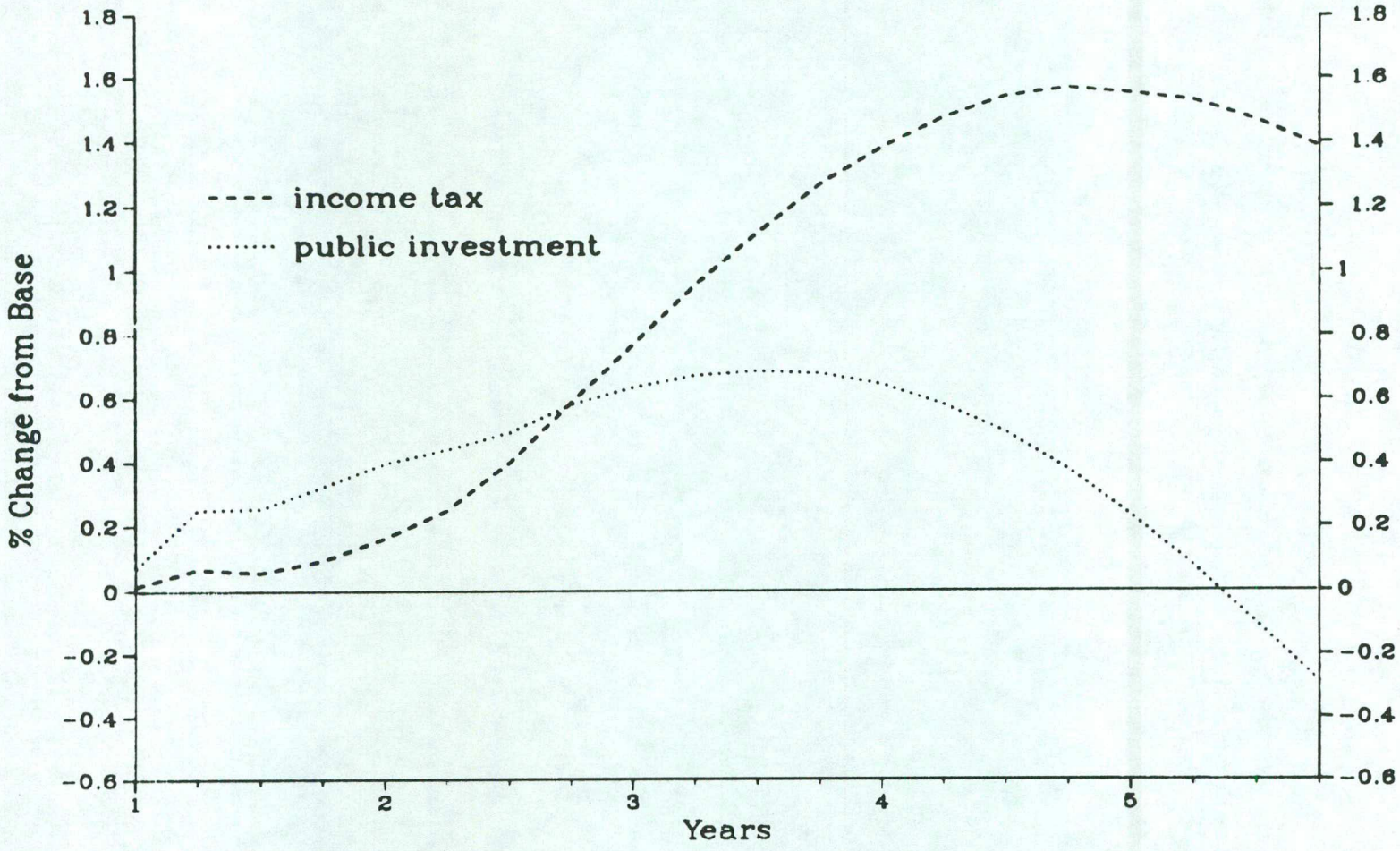
4. There are two important things to bear in mind in interpreting simulation results like these and others performed on the Treasury model. The first is that the model does not include any impact from either tax cuts or infrastructure expenditure on the supply side of the economy, other than the effects that tax cuts are assumed to have in moderating wage growth. To the extent that supply side improvements give rise to more activity in the short term, the increase in employment might be larger than in the simulations. In the long term employment might be increased if productivity and real wages are higher, and hence more people are attracted into the labour force.

5. Secondly, the assumption that markets expect that the increase in the PSBR will be reversed after five years is only one of a number of possible assumptions. Markets might, for example, expect that the fiscal expansion would ultimately be accommodated by faster monetary growth rather than reversed. Different assumptions would produce different results.

6. The simulations illustrated in the chart are two of a group of standard policy simulations which we do as part of our macroeconomic policy analysis work. They are described in more detail in paragraphs 25-48 of the attached paper by Mr Bredenkamp. We shall be discussing this paper with the Treasury Academic Panel quite soon, and, depending on how that goes, we may suggest that it is published as a Treasury Working Paper.

J ODLING-SMEE

EMPLOYMENT


income tax
public investment
% Change from Base
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
1
2
3
4
5
Years

jc10

From: **J ODLING-SMEE**
8th December 1987

CHANCELLOR OF THE EXCHEQUER

Ch
Seems OK & pulled this?
2 suggestions for amendment,
& paras 11 & 17
AA

cc Economic Secretary
Sir Peter Middleton
Sir Terence Burns
Mr Byatt
Mr Cassell
Mr Scholar
MEG
Mr R I G Allen
Mr S Davies
Mr Grice
Mr Melliss
Mr Riley
Mr Bredenkamp
Mr Cropper
Mr Call

WORKING PAPER ON MACRO-ECONOMIC POLICY SIMULATIONS

NA
shown to
you @
time.

I attach a draft working paper by Mr Bredenkamp. It has been agreed with Sir Terence Burns. You may have already seen it when it was attached to my minute of 29th October to the Economic Secretary. The main themes and conclusions of the paper can be seen by glancing at the introduction and conclusions (paragraphs 1-8 and 113-123).

2. It reports and discusses simulations of monetary and fiscal policy changes on the Treasury model. Every year we update policy simulations similar to those in this paper as part of the process of maintaining our ability to offer advice on the effects of a range of macro-economic policies. The simulations in this paper are those we prepared for internal purposes in advance of last year's MTFS and Budget season. But the text has been specially prepared and is aimed at academic economists. It was discussed at the last meeting of the Academic Panel, who found little to criticise and thought that the work represented the general state of the art.

3. The numbers in the paper are not presented as the effects of macro-economic policies. On the contrary, the paper emphasises the margins of error around the numbers and the need to assess the sensitivity of any results to the main behavioural assumptions, particularly with regard to expectations formation. It illustrates

how changes in the assumptions about how financial markets assume that policy will evolve (eg will it be reversed, or will fiscal expansion be accommodated?) in future can alter simulation results in a major way.

4. The paper argues that fiscal and monetary policies have little effect on real variables in the long term except to the extent that they alter the supply performance of the economy (eg through the effects of changes in private investment on productive potential, or the effects of changes in taxes on incentives). But since the Treasury model does not incorporate some of the relevant supply side mechanisms, because it has proved difficult to measure them in practice, most of the effects which simulations of this type pick up are those operating through the demand side. The paper shows that the demand side mechanisms produce temporary real effects of macro-economic policy changes, lasting a number of years, and it argues that these are the result of markets not bringing about instantaneous adjustment to the policy changes. Once adjustment is complete, initial effects of this sort on real variables are largely reversed. Cuts in income tax by contrast are shown to produce a sustained rise in output by virtue of their beneficial effects on wage pressure.

5. There are two broad reasons why we think that it would be useful to make the paper available to economists outside the Treasury. First, we would hope to obtain feedback from economists other than those on the Academic Panel, from which we might be able to improve our analysis in future. Secondly, it should be helpful to have on the record a statement of why policy simulations can often be misleading if they are incorrectly designed, and how wide the margins of error can be. Although there have been mercifully few attempts in recent years by people outside government to advocate the case for alternative economic policies on the basis of policy simulations, it still happens occasionally. It would be easier to dismiss them if we could point to a discussion of the uncertainties and ambiguities that surround simulation results when they attempt to take account of the complexities of the real world.

6. It takes a week or two to make the final preparations for publication, so that we would be able to release the paper in the usual low key way round about Christmas. Normally this goes unnoticed, at least until it is mentioned in the next EPR which is due in February. If you preferred we could always postpone the EPR notice until the post-budget issue.

J ODLING-SMEE

MACROECONOMIC EFFECTS OF CHANGES IN FISCAL AND MONETARY POLICY

by Hugh Bredenkamp

Contents

MACROECONOMIC EFFECTS OF CHANGES IN FISCAL AND MONETARY POLICY

Introduction

1. The academic literature on macroeconomic policy is overwhelmingly of the abstract theoretical variety, and analysis using simulations on macroeconometric models is scarce by comparison. What simulations studies there are typically involve rather mechanistic comparisons between different fiscal and monetary policy instruments and different models, the emphasis being on numerical results. With a few notable exceptions, they have tended to neglect some of the wider issues, for example concerning the specification of policy and the treatment of expectations, which the theoretical literature tells us are crucially important in the analysis of policy.

2. This paper attempts to address these wider questions with reference to simulations using the Treasury Model. As well as illustrating a number of issues concerning simulation design, we aim to show how, and to what extent, the estimated effects of policy changes differ with differing assumptions. In doing so, we attempt to relate the simulation results to the basic theoretical structure of the model.

3. One of the messages in the paper is that - given the uncertainty surrounding some of the key relationships in the Treasury and other models, and particularly in the treatment of expectations - it would be unwise to put too much emphasis on the precise numbers emerging from model simulations. We therefore concentrate more on the nature of the effects involved; for example, the extent to which changes in nominal demand feed into prices rather than output, or the effects of changes in the mix of policy on the structure of the economy, and the way these responses vary over time.

4. We are concerned here primarily with the effects of policy operating through the demand side. In practice, changes in taxes and particular types of public spending are also likely to have supply side effects which could, in the long run, be more important. The Treasury Model, in common with most other large macroeconomic models, has been developed primarily for forecasting and analysis of the short to medium term, and does not provide a comprehensive explanation of

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This paper has benefitted greatly from various discussions within the Treasury. In particular, I should like to thank Chris Melliss, John Odling-Smee, Chris Riley, Peter Westaway, Rod Whittaker and members of the Treasury's Academic Panel for their valuable comments. Responsibility for the opinions expressed, and any remaining errors, is mine alone.

the economy's long run productive potential. The model makes no allowance, for example, for the possible effect of public investment (or, for that matter, private investment) on the size and quality of the total capital stock; of government training programmes on the quality of the labour force; of changes in taxation on incentives; or of fluctuations in the rate of inflation on market efficiency and business confidence. By overlooking these factors commentators have often drawn from simulation results unwarranted conclusions about the relative effects of different fiscal measures on output and employment in the long run.

5. The paper is organised as follows. In Section I, we describe briefly the prior adjustments we have made to the published version of the Treasury model, the most important of which is the assumption of consistent expectations. Section II then discusses issues relating to the specification of policy simulations, the emphasis being on the appropriate representation of the policy framework within which changes are assumed to occur, and the implications of consistent expectations for simulation design. The next two sections deal with, respectively, simulations of changes in the policy mix (including alternative rules for the operation of monetary policy) and changes in the overall policy stance. Section V discusses alternatives to the assumption of consistent expectations: this has a number of aspects, and we look separately at the subsidiary assumptions of rational expectations, perfect foresight and the credibility of announced policy changes. Section VI considers the sensitivity of the simulation results to variations in some of the key relationships in the model (those determining earnings and trade volumes are the main examples) and assesses how robust the main results are over a range of reasonably plausible assumptions.

6. We assume throughout that where there is no direct impact on the supply side, the long run effects of macroeconomic policy on output, employment and other real variables are likely to be small. This conclusion is arrived at mainly by consideration of the underlying theoretical properties of the Treasury model: it is very difficult to make clear statements about the long run based solely on simulation results, since adjustment is seldom completed within a feasible simulation period. There is, however, evidence from some simulations that the model is tending towards the sort of long run equilibrium we describe.

7. The final section gives some conclusions. As far as simulation results are concerned, we suggest that short run real effects can be attributed almost entirely to differing speeds of adjustment in different markets (goods, labour, foreign exchange), which in turn bring about changes in relative prices. Given the importance of adjustment lags in the model, it is not surprising that the particular

expectations assumption can have a significant effect on simulation results. It also means that, generally speaking, the consequences of amending key model relationships can be related directly to their effects on relative speeds of adjustment.

8. The main methodological arguments in the paper are, first, that considerable importance should be attached to setting up an appropriate policy framework (normally in terms of intermediate objectives) and, secondly, that simulation results should be accompanied by an assessment of their sensitivity to the main behavioural assumptions, particularly with regard to expectations formation, which underlie the model.

I THE MODEL

9. All the simulations in this paper have been run using an amended version of the 1987 Treasury Public Model. The latter included a new equation for the determination of earnings (see Rowlatt (1986)), but was in most other respects similar to the 1986 Public Model described in Melliss (1986).

Expectations

10. In terms of its effect on simulation properties, the most important amendment we have made to the standard model is to overwrite the equations for the expected exchange rate and the expected long term interest rate (the two main expectational variables in the model) by an assumption of rational expectations with perfect foresight. This implies that the expected values of these variables and the values generated in a model simulation are set equal in each period, and the assumption is therefore referred to as one of consistent expectations. This is discussed further in section V, and in more detail in Westaway and Whittaker (1986). Use of consistent expectations requires the imposition of terminal conditions on the expectational variables (or, more accurately, on the solution of the model as a whole), and in the simulations in this paper we require that at the terminal date:

i. the basic balance (current account plus structural capital flows) is zero, and

ii. long term interest rates have stabilized, so that the expected capital gain on government bonds is zero[1].

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1 In practice, it is sufficient for both consistent expectations and the associated terminal conditions to hold relative to the simulation base. There is an implicit assumption that the base embodies a rational expectations equilibrium.

Rational agents are assumed to form their expectations on the basis that these conditions will hold in equilibrium, and that equilibrium has been achieved by the terminal date (assumed to be nine years from the beginning of the simulation).

Funding

Needs updating for policy on interest.

11. Since 1985, the authorities have operated a policy of "full-fund" of the PSBR. Sales of public sector debt outside the banking sector are set approximately equal to the PSBR in any given financial year.

12. The Treasury model equations, however, as they stand, will not ensure that this requirement is met in simulations. Debt sales in the model are determined mainly by the equation for M3 (formerly £M3), which allocates the private sector's gross sterling-denominated wealth between broad money and bonds according to, amongst other things, relative rates of return. For the simulation model used in this paper, we have inverted the M3 equation so that the relative rate of return on bonds (ie the slope of the yield curve) changes in order to satisfy the funding requirement, period by period. The model equation for the yield curve (the RLONG equation) is therefore replaced.[2] In making this change, we also found it necessary to increase the implied degree of substitutability between money and bonds in the model (by a factor of ten[3]), so as to produce plausible long term interest rate responses in simulations.

Cash Limits

13. The Treasury model equations allow complete flexibility in the setting of cash limits. The detailed assumptions we have made for this exercise (as well as assumptions regarding local authority expenditure and finance, and the national insurance fund) are explained in Annex III. Broadly speaking, non-demand-determined expenditure is assumed to be fixed in cash terms in the first year of a simulation. In subsequent years, we allow some slippage in the cash value of expenditure as the price level changes relative to base: if the overall policy framework is an accommodating one (as defined in the next section), nominal expenditure changes in line with prices; if policy is non-accommodating, half of any change in prices is reflected in higher nominal expenditure and half in

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2 We make a distinction between "funding policy" and "monetary policy". The former influences the term structure of interest rates; the latter their general level.

3 This adjustment is not as extreme as it may seem. The model coefficients are very small, and were imposed rather than estimated.

lower real expenditure. This is intended to be a reasonably neutral representation of the possible outcome for public expenditure, and is not a formal model of the government's decision-making process.

II. SIMULATION SPECIFICATION

14. This paper is about the effects of changes in fiscal and monetary policy. In practice, of course, these changes will be brought about by altering the settings of the various policy instruments at the authorities' disposal. But decisions which involve changes in tax rates, spending plans, interest rates, and so on, are not taken in a vacuum. For example, if a government chooses to raise or lower a particular tax rate (whether or not the decision was taken on macroeconomic grounds), we would generally expect it to assess:

i. the extent to which the tax change involves an ex ante change in fiscal stance;

ii. whether the change in fiscal stance is desired and, if not, which other fiscal instrument will be used to offset it, or

iii. if some change in fiscal stance is intended, whether it should be accompanied by a countervailing (or, possibly, reinforcing) change in monetary policy.

15. This implies that, in general, the effects of a change in a particular policy instrument cannot be analyzed without first specifying the overall policy framework within which that change is assumed to take place. If, for example, the government of the day were to express its fiscal policy objectives in terms of a target for the budget deficit, it would be unrealistic to consider a change in tax rates or public expenditure where the implied change in the budget deficit was entirely endogenous (ie subject to the responses of the private sector, and to changes in other variables which affect the budget deficit, such as the level of interest rates). Likewise, if monetary policy were characterized by a target for the money supply, a change in policy should be represented not by an unconditional shift in the level of interest rates, but by a change in the monetary target. We are suggesting, in other words, that for a given policy regime it should be changes in stance which we stimulate (since it is the stance of policy which is formally exogenous), rather than changes in instrument settings per se.

16. Indeed, with forward-looking expectations, simulations which are specified in terms of "open loop" changes in instrument settings will often fail to produce stable solutions: for example, a sustained change in nominal interest rate, on its

own, can produce an explosive path for real interest rates, and hence demand; similarly, a change in tax rates can generate an explosive path for the budget deficit, and hence for debt interest payments and real interest rates. By contrast, a reduction in nominal interest rates brought about by a tightening in both fiscal and monetary policy will generally be perfectly sustainable; and a reduction in tax rates which is made conditional on a particular change in the PSBR ex post cannot, by construction, destabilise the budget deficit, since rising debt interest costs will automatically imply smaller tax cuts (though this does raise the possibility, described later, that tax rates will then become unstable).

Money GDP

17. In this paper, we describe the framework of macroeconomic policy in terms of an objective for growth in money GDP. This is the most convenient representation of the present Government's approach to macroeconomic policy, as set out in the MTFS. Although in early versions of the MTFS objectives were expressed in terms of monetary aggregates, rather than money GDP itself, and the emphasis on different aggregates and other indicators has changed over time, the fundamental principle has been essentially the same since 1979. The use of a nominal rather than a real objective as the basis for macroeconomic policy can be justified by:

i. an underlying model of the economy in which the level of output cannot be raised in the long run by increasing the rate of inflation, and

ii. the need for a policy framework which provides a commitment against both inflationary pressure and deficient demand in the economy.

18. In principle, the money GDP objective should be raised or lowered in order to accommodate shifts in the economy's productive potential. However, the effects of macroeconomic policy on productive potential are very small in the model, and so their consequences for the desired path of money GDP are ignored in this paper.

The stance and mix of policy

19. Both fiscal and monetary policy can affect the growth of money GDP, and the balance between them can influence the composition of demand in the economy (consumption, investment, net overseas trade) as well as the split between output and inflation in the short run for any given change in money GDP. This suggests consideration of two types of policy change;

i. a change in overall policy stance, represented by a change in the growth rate of money GDP, for a given mix of fiscal and monetary policy, and

ii. a change in the mix of fiscal and monetary policy for given money GDP growth.

All macroeconomic policy changes can be characterised by one or other of these, or by some combination of the two. The first is of interest in the context of strategies for changing the rate of inflation or stabilising nominal demand, for example after a shock or over the cycle. The second is of interest from the point of view of longer term objectives concerning the structure of demand and the accumulation of wealth in the economy. Both types are illustrated in this paper.

20. Changes in fiscal stance are represented here by changes in the PSBR, expressed as a share of money GDP. The authorities are assumed to use one of two fiscal instruments, public investment expenditure and personal income tax; and one monetary policy instrument, the short term interest rate. We interpret changes in fiscal stance which are accompanied by unchanged real short term interest rates[4] as implying no change in the mix between fiscal and monetary policy. In contrast, a combination of higher PSBR and higher real interest rates, for given money GDP, is interpreted as a relative loosening of fiscal policy and tightening of monetary policy.

21. It is a familiar result in macroeconomic theory (see Blinder and Solow (1973)) that this last combination - a change in fiscal stance with non-accomodating monetary policy - may, depending on the parameters of the underlying model, have to be reversed at some point in the future. For as long as a fiscal expansion is maintained in these circumstances, the ratio of public sector debt to money GDP will be rising, tending to push up real interest rates. Higher interest rates and an increasing debt burden both add to public sector debt interest payments, and this may set off a spiral - involving either further increases in the PSBR, debt, interest rates and so on, or (as in our case, where the increase in the PSBR is fixed ex post) an accelerating change in the "residual" fiscal instrument (eg a rising tax rate), so as to offset the rising cost of debt-service.

22. If market expectations are purely adaptive - or if forward-looking expectations have little impact on current behaviour - it may be reasonable when simulating the medium term effects of policy changes to ignore the fact that some combinations of policy change may have to be reversed in the long run. But with

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4 This is assumed to be the most accommodating sustainable monetary policy option possible. It will not generally be feasible, for example, to maintain unchanged nominal interest rates with an inflationary or deflationary change to fiscal policy, particularly in an economy with very open capital markets.

consistent expectations and a model in which (as we shall see) expectational variables are important, the problem of unsustainable policies cannot be ignored.

23. Except in section V, where we consider some alternative approaches, all the simulations in this paper which involve a change in policy mix therefore assume that policy is realigned after five years, reverting to the same mix and overall stance of policy as in the base. Given that expectations are assumed to be consistent, this realignment is perfectly anticipated from the beginning of the simulation period. The choice of year 6 as the date of realignment is, of course, an arbitrary one. Because the terminal date for the simulations occurs at the end of year 9, realigning any later than year 6 would risk severely distorting the results[5] (see Wallis et al (1986), p52). On the other hand, it is useful to have the realignment occurring beyond the medium term, this being the period for which simulation results are normally presented. Realignment after five years therefore seems a reasonable compromise.

24. Changes in the overall stance of policy without changes in the mix are not necessarily unsustainable. In these simulations we do not, therefore, assume that policy is expected to be reversed.

III CHANGING THE MIX OF POLICY

25. In this section, we consider the effects of increasing the PSBR by one per cent of GDP ex post, using short term interest rates to maintain an unchanged path for money GDP. This is the "looser fiscal policy - tighter monetary policy" case described earlier. Since the effects are likely to differ significantly depending on whether the fiscal expansion takes the form of higher spending or lower taxation, we compare the results for two representative fiscal instruments, general government investment and personal income tax[6].

26. It is worth noting at this point that the simulations could equally well have been calibrated in terms of a given change in short term interest rates, with money GDP maintained by an offsetting shift in fiscal stance. Which particular instrument is assigned to the money GDP objective has no significance for the

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5 For a similar reason, we are not able to assume that realignment occurs beyond the terminal date. Since the terminal conditions are, in a sense, equilibrium conditions, it would be wrong to impose these at a point in the simulation where the economy was still on an unstable path.

6 Changes to personal income tax are assumed to take the form of higher or lower personal allowances, rather than changes in marginal tax rates.

results, and it is not our intention to imply that either one is more appropriate as the residual instrument than the other (indeed, in the next section, fiscal and monetary policy are used together to alter growth in money GDP).[7]

27. In what follows, it should be borne in mind that financial markets are assumed to anticipate a reversal of the change in policy mix. An alternative, discussed later, is to assume that markets expect that the government will be unable or unwilling to reverse the fiscal expansion after five years, and will choose instead to accommodate it by faster monetary growth. In these circumstances, the short term effects of the same change in policy mix would be quite different (see section V).

Output and inflation

28. Charts 1a and 1b show the effects of the change in policy mix on the level of output (GDP) and the RPI inflation rate (more detailed results are given in Annex I). The main feature of these results, requiring some explanation, is the significant though temporary improvement in the split between output and inflation. This occurs both for increases in public spending and for cuts in income tax, though the rise in output is bigger, on average, and more prolonged, in the case of lower taxes.

29. Since policy is operated so as to maintain the same level of aggregate nominal demand, it follows that for the change in policy mix to raise the level of real output (as Chart 1 shows), it must somehow generate a corresponding reduction in the level of prices (relative to what they would otherwise have been)[8]. In practice, there are three processes tending to alter prices:

i. pressure-of-demand effects in domestic markets for goods and labour

ii. exchange rate effects

iii. the effects of fiscal changes on relative prices and wages.

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7 Even if we included an additional objective (eg a target for external balance in the short run), it would still not be necessary to make an assumption about the assignment of instruments. In fact, an optimal solution will generally involve the application of both instruments to both targets.

8 This is true by identity if prices are measured by the GDP deflator; it will tend to be true for other price indices too, although clearly short run changes in retail prices may be influenced by factors, such as mortgage interest rates, which do not affect the GDP deflator.

Effects of a change in policy mix with unchanged money GDP

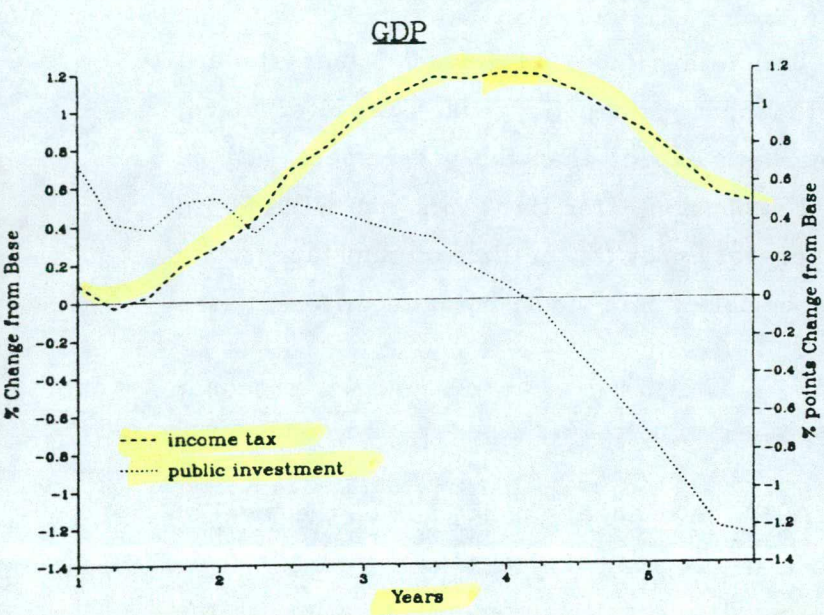

CHART 1a

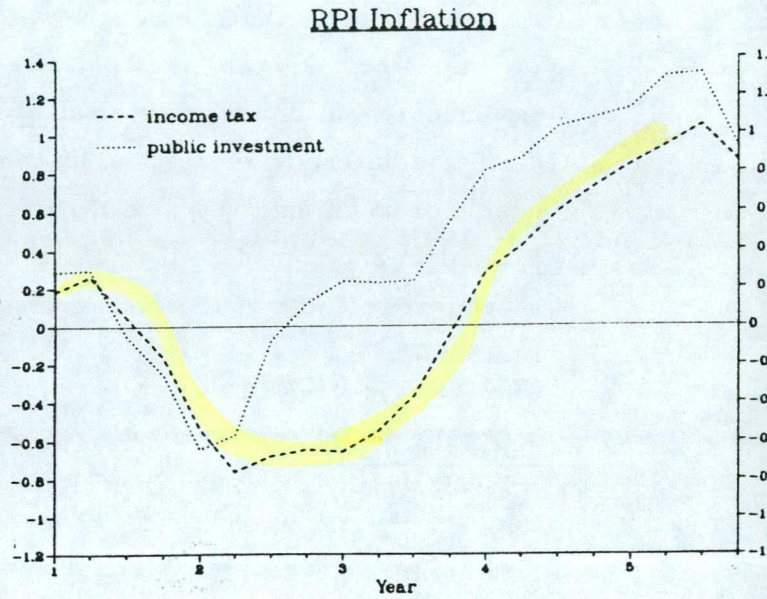

CHART 1b

30. The direct effect of a relative loosening of fiscal policy is generally to raise domestic demand, and worsen net trade (see Chart 3 in paragraph 42). Pressure-of-demand effects will therefore tend to imply higher, rather than lower, prices and wages. On the other hand, the model suggests that adjustment of domestic prices to changes in excess demand is a comparatively slow process (this phenomenon is referred to again, in later sections). Over a three or four year period, therefore, pressure-of-demand is unlikely to have much effect on the aggregate price level.

31. By contrast, the role of the exchange rate in explaining short run changes in the output-inflation split is a crucial one. When the shift in policy mix is announced, operators in the foreign exchange market will have to assess:

i. the implications for the equilibrium real exchange rate;

ii. the effect on the price level in the long run and hence, given i., the implications for the equilibrium nominal exchange rate, and

iii. the nature of the adjustment path towards that new equilibrium, given changes in domestic (nominal) interest rates and the current account of the balance of payments.

32. As far as i. and ii. are concerned, a rational currency speculator should conclude that a temporary shift in the mix of policy, within a framework which effectively ties down the long run price level, will have no appreciable effect on either the real or the nominal equilibrium exchange rate. It is conceivable that the change in the net overseas asset position during the period of the fiscal expansion could have some lasting effects on the real exchange rate (if the effects on net IPD[9] and structural capital flows are not offsetting), but this is likely to be of second-order importance.

33. In principle, there could also be long run real exchange rate changes if the shift in policy mix led to a permanent change in the domestic capital stock. But in the Treasury model, the capital stock is not explicitly identified, and there is no link between investment expenditure and long run productive potential.

34. In stage iii, the relative weight given to interest rates and the short term prospect for the balance of payments in determining the current value of the exchange rate will depend on the degree of subtitutability between domestic and foreign assets (and hence also on the degree of international capital mobility). In the limit, with perfect substitutability, current account deficits can be financed

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8 This is true by identity if prices are measured by the GDP deflator; it will tend to be true for other price indices too, although clearly short run changes in retail prices may be influenced by factors, such as mortgage interest rates, which do not affect the GDP deflator.

9 Interest, profits and dividends.

for ever at world real interest rates. The current level of the exchange rate would then be determined solely by the expected equilibrium exchange rate (which we have suggested will be more or less unchanged for a temporary shift in policy mix), and the uncovered interest parity condition. This would imply an upward jump in the exchange rate, when the policy change is announced, so that the rise in domestic interest rates generated by a tightening of monetary policy could be offset by an equivalent increase in the expected rate of currency depreciation[10].

35. In fact, the Treasury model assumes that sterling and foreign currency assets are rather less than perfect substitutes. But as Charts 2a and 2b show, our results nevertheless conform quite closely to those of the standard "overshooting" model, with an immediate upward jump in the exchange rate of 2-4 per cent, depending on which fiscal instrument is being used. It is this initial rise in the exchange rate which contributes most, over the first year and a half, to the lower rates of inflation associated with a relative tightening of monetary policy[11].

36. As we have said already, given fixed money GDP, lower inflation must be associated with higher output. This comes about through a combination of higher real incomes, reflecting the improvement in the terms of trade, and positive real balance effects, offset to some extent by poorer international competitiveness.

37. Note that the initial output gain is bigger for higher public spending than for lower income taxes. This is because the direct impact on domestic demand is greater for public spending increases - less of the stimulus leaks into saving and imports. Consequently, the offsetting rise in interest rates needed to keep money GDP on track is bigger; the expected depreciation of the exchange rate is greater; and so the initial upward jump in the exchange rate (and hence reduction in inflation) is also bigger. Of course, as the exchange rate depreciates from its new level, inflation begins to pick up again. This combines with the effects of higher real interest rates to crowd-out the initial output gain as is apparent in Chart 1.

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10 These movements can be expressed in real or nominal terms, as can the uncovered interest parity condition.

11 Less-than-perfect substitutability means that sterling rates of return have to rise far enough to finance the deterioration in the current account. Hence, the exchange rate jumps up by less, and then depreciates more slowly, than it would with perfect substitutability.

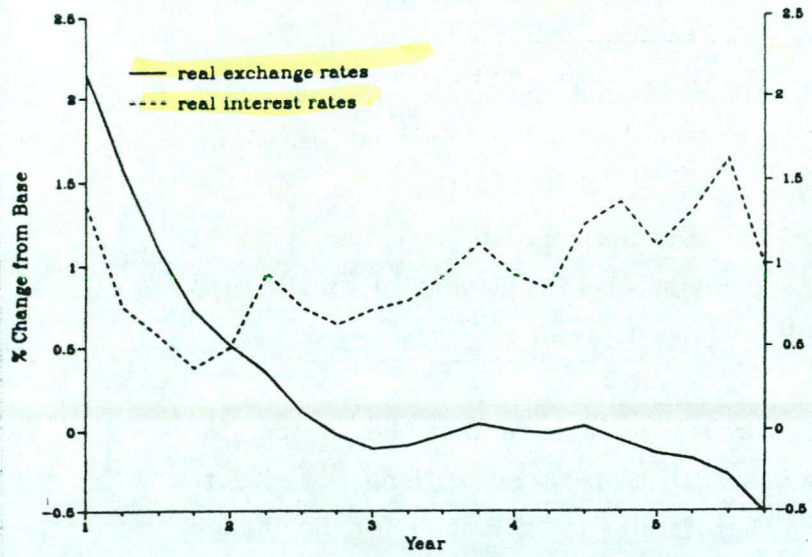

CHART 2a

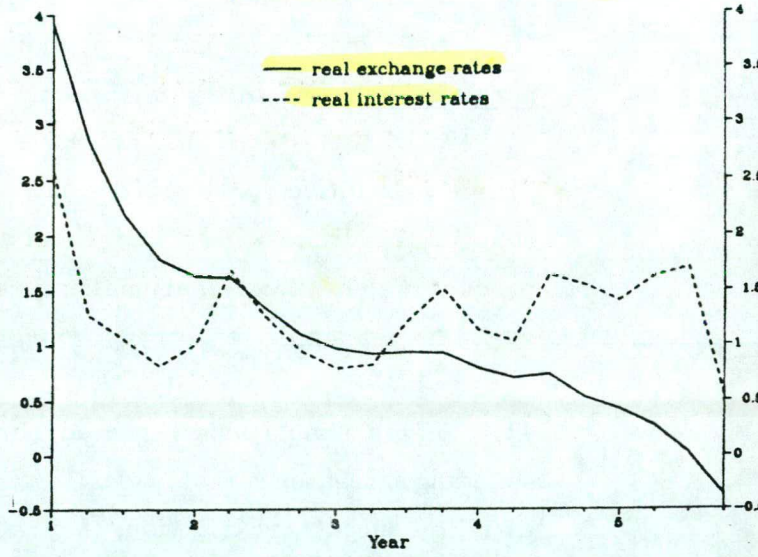

CHART 2b

38. From about the second year onwards, the most significant difference between the effects of higher spending and lower taxes can be attributed to the direct effect of income tax cuts on pay settlements. A lower rate of income tax, whether brought about by lower marginal rates or higher allowances, directly increases employees' take home pay, for a given level of earnings (ie raises the "retention ratio"). Incorporated in the Treasury model is the assumption that wage-earners are concerned more with take home pay than with levels of gross pay. Consequently, they are prepared to accept lower wage increases when income tax is reduced (the labour supply curve shifts rightwards), and will press for higher increases when income tax rises.[12] (See Rowlatt (1986)).

39. From firms' point of view, therefore, lower income taxes tend to reduce real product wages, and hence unit labour costs. Chart 1b shows how, for a switch in policy involving lower income tax, this retention ratio effect sustains the initial fall in inflation for almost twice as long as in the case of higher public spending, with a correspondingly bigger rise in output.

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12 This effect is consistent with the historical evidence but is not well-determined empirically, and in section VI we consider a simulation in which it is excluded.

40. If the reduction in taxes could be maintained - for example, if it were "financed" by lower public spending - the Treasury model would predict a permanent rise in output (ie the long run balanced budget multiplier in the model is negative). Knoester (1983) describes this phenomenon as the "inverted Haavelmo effect". Intuitively, the shift in the supply curve arises because the income tax cut reduces the distortionary wedge between the real consumption wage and the real product wage. Lower national insurance contributions (employers' or employees') would have a similar effect, as would cuts in indirect taxes.

41. In the simulations reported here, however, we assume that the tax cut (or spending increase) is reversed after five years. If there were any long run effects at all on output and inflation, they would therefore be a result solely of the change in asset positions brought about during the initial five year period. As was suggested earlier, these effects are likely to be negligible, in the Treasury model at least, particularly given a base in which the economy is growing (since incremental changes to asset stocks would in this case become increasingly insignificant in relation to the level of income).

The composition of demand

42. As well as affecting the level of output, in the short to medium term at least, a change in the fiscal-monetary mix also tends to alter the balance between consumption and investment in the economy. This is illustrated in Charts 3a and 3b below, which show changes in the value of consumption, domestic investment, and the current account (ie net overseas investment) as a share of money GDP. The changes in real interest rates and the real exchange rate, discussed earlier, are part of the mechanism bringing this about.

43. Clearly, in the case of higher public expenditure, the picture is heavily influenced by our assumption that all of the extra spending is investment. But there are a number of other factors at work too;

- most of the initial offset to higher investment takes the form of lower consumption; this is brought about largely by adverse wealth (revaluation) effects due to higher interest rates and a higher exchange rate;
- after a year or so, most (but not all) of the effect on consumers' expenditure has been unwound, as the stock of consumer durables approaches its new equilibrium;

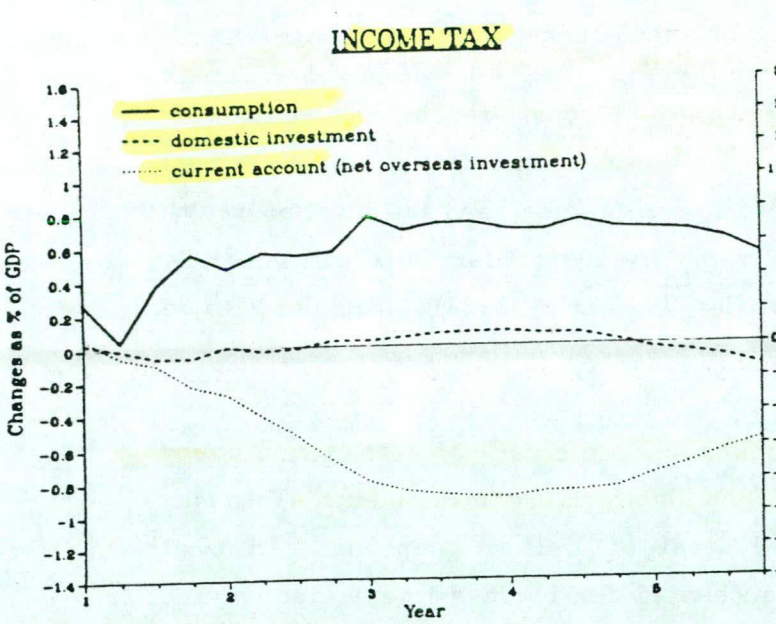

CHART 3a

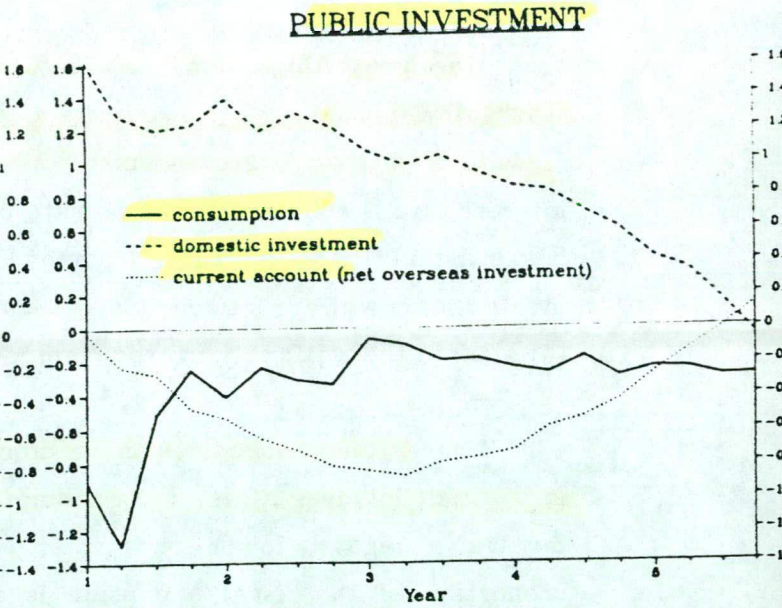

CHART 3b

- this is matched partly by a deterioration in the current account (reflecting a higher real exchange rate), partly also by a gradual decline in the share of total investment in GDP; private investment is crowded-out by higher real interest rates, and public investment by steadily rising debt interest costs (given the revised PSBR constraint).

44. In principle, this last effect could apply also in the case of lower income tax. As debt interest costs rise, the initial reduction in income tax would be gradually "squeezed out". But, in practice, over the five year period during which the policy change is implemented, the beneficial effects of lower income tax on real earnings (via the retention ratio), and hence on the public sector's wage bill, fully offset rising debt interest payments. As a result, in contrast to the higher public spending case, the initial rise in domestic absorption is maintained for much longer, implying a more persistent deterioration in the current account (see Chart 3a).

45. These structural effects provide one argument against making temporary shifts in the mix of policy, to take advantage of the generally favourable short term effects on output and inflation. A move towards lower taxes, a bigger fiscal deficit and higher real interest rates reduces inflation and raises output in the

short term, but only at the "cost" of a decline in the stock of national wealth (defined as the sum of domestic wealth and net overseas assets).

46. Whether this is a good or a bad thing clearly depends on what is the desired stock of wealth: in some circumstances it may be considered beneficial to bring forward a part of future consumption to the present. But if in the base the real interest rate is equal to the social rate of time preference, and the level of wealth is consistent with that rate, a change in the fiscal-monetary mix will generally involve some welfare loss on this account (see Vines et al (1983)). This needs to be set against the welfare gain from temporarily higher output and lower inflation.

47. The argument becomes more complicated in the case of a change in policy mix which involves at least an element of higher public investment. This may involve a higher, lower or unchanged level of welfare, depending on what proportion of the fiscal expansion is accounted for by investment, and on the efficiency of public investment relative to the other domestic and overseas investment which it crowds out.

48. There are a number of other reasons why it may be unwise for the authorities to exploit the possibility of temporary output gains from changes in the fiscal - monetary mix. One is that, as we have seen, what gains there are derive largely from a real exchange rate appreciation, an effect which may not come about if other countries try, simultaneously, to alter the mix of their policies in the same way as the UK (see Currie (1987)). Secondly, there is a risk that, as output growth falls after the first two or three years of the strategy, governments will be tempted to try to offset this by accommodating the rise in inflation, and possibly by further loosening of fiscal policy. This is a recipe for accelerating inflation and perhaps, ultimately, stagflation. Moreover, if the markets anticipate an outcome of this sort, even the short run gains may fail to materialize, because of (perfectly rational) adverse confidence effects on the exchange rate.

Alternatives to money GDP control

49. We argued in the previous section that in broad terms, given the MTFS, an objective for money GDP provided the natural framework within which to assess macroeconomic policy changes. However, it could be said that quarter-by-quarter control of money GDP as assumed in the simulations discussed so far in this paper, is an overly-stylized representation of policy.

50. In practice, money GDP control is a medium term objective. In the short term, policy has been operated with reference to monetary targets, the exchange rate and other forward indicators. There are three main reasons for this:

i. initial estimates of money GDP are only available with a one-quarter lag, and even then are generally subject to significant revision as further data become available. Some other, more timely, guide for policy is needed in the interim;

ii. changes in fiscal and monetary policy take time to influence growth in money GDP, making short term control difficult, if not impossible[13];

iii. given the costs involved in continually changing fiscal and monetary policy instruments, it is not necessarily desirable (even if feasible) to try to offset every short term fluctuation in money GDP[14].

51. Although it is beyond the scope of this paper to deal comprehensively with indicator regimes, it is worth looking briefly at how a couple of alternative, perhaps more realistic, representations of the policy framework might affect simulation results. One obvious alternative to short term money GDP control is a monetary target: in current circumstances, a target for MO. Accurate information on MO growth is available extremely quickly; its relation to money GDP isreasonably stable; it responds rapidly to changes in policy instruments (particularly interest rates); and the fact that its velocity is a function of interest rates means that an MO target automatically allows some short term variation in money GDP.

52. On this last point, however, there is a problem insofar as a sustained change in money incomes with an unchanged MO target can, under certain conditions, be partially accommodated by a permanent change in velocity, so that money GDP will not be brought back to base levels even when MO is kept on track (see Annex II for proof). We therefore consider, as a second option, one in which the MO target is supplemented by a requirement that the money GDP objective should be achieved in the long run. This is implemented via a feedback rule for nominal interest rates (r), with proportional control on MO and integral control on money GDP;

$$\Delta r = 245 \Delta \ln MO + .25 \ln MGDP_{-1}$$

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13 Attempts to control money GDP precisely in model simulations give rise to instrument instability problems for just this reason. The "fixed money GDP" simulations in this paper therefore have to allow some trade-off between achieving the money GDP target and preventing excessive fluctuations in policy instruments. (See Melliss (1984)).

14 See "Financial Statement and Budget Report 1987-88"; para 2.04.

(all variables are measured relative to base). The parameters were chosen by re-running the two fiscal-monetary mix simulations, computing the optimal feedback rules for each[15], and then taking a simple average.

53. Charts 4 and 5 on page 19 show how the different policy rules affect the results of a shift in the mix of fiscal and monetary policy - in terms of money GDP control, output and inflation.

54. Chart 5a demonstrates clearly the case against an unconditional MO target as a method of controlling money GDP in the medium term. The rise in interest rates associated with fiscal expansion (see Chart 2) pushes up the opportunity cost of holding MO, and so increases the income velocity of money. An MO target will therefore imply higher money GDP relative to base, as Chart 5a shows. Both output and inflation are higher than would be the case with direct control of money GDP, though the increase in output tends to fall over time (see Chart 5b).

55. The contrast with the case of a reduction in income tax is striking. The important factor here is that MO is held mainly by the personal sector, which is the sector to benefit most directly from lower income tax. The rise in personal disposable incomes relative to money GDP tends to push MO velocity down (ex ante). At the same time, as in the case of increased public spending, the higher interest rates needed to control MO are tending to push velocity up. The net effect in the first three years or so of the policy change is to reduce velocity and hence reduce money GDP (though this is largely fortuitous and is reversed later as interest rates rise further). Lower money GDP is reflected entirely in a lower path for output, on average, than would have been obtained under a policy of direct money GDP control.

56. The endogeneity of velocity is one reason why the authorities have tended not to set unconditional monetary targets for the medium term[16]. The sort of feedback rule described above is a way, albeit a very simplistic way, of modelling a process whereby monetary targets are updated to take account of shifts in velocity. As Charts 4 and 5 show, it delivers far better money GDP control than an unconditional monetary target.

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15 ie selecting the parameters which minimise the deviations in money GDP from target.

16 In the 1987-88 FSBR, for example, a target is given only for the coming financial year (and even that is a range); beyond the first year published projections for MO growth are "illustrative ranges" rather than targets. (para 2.13, op.cit.)

CHART 4:

Lower Income Tax

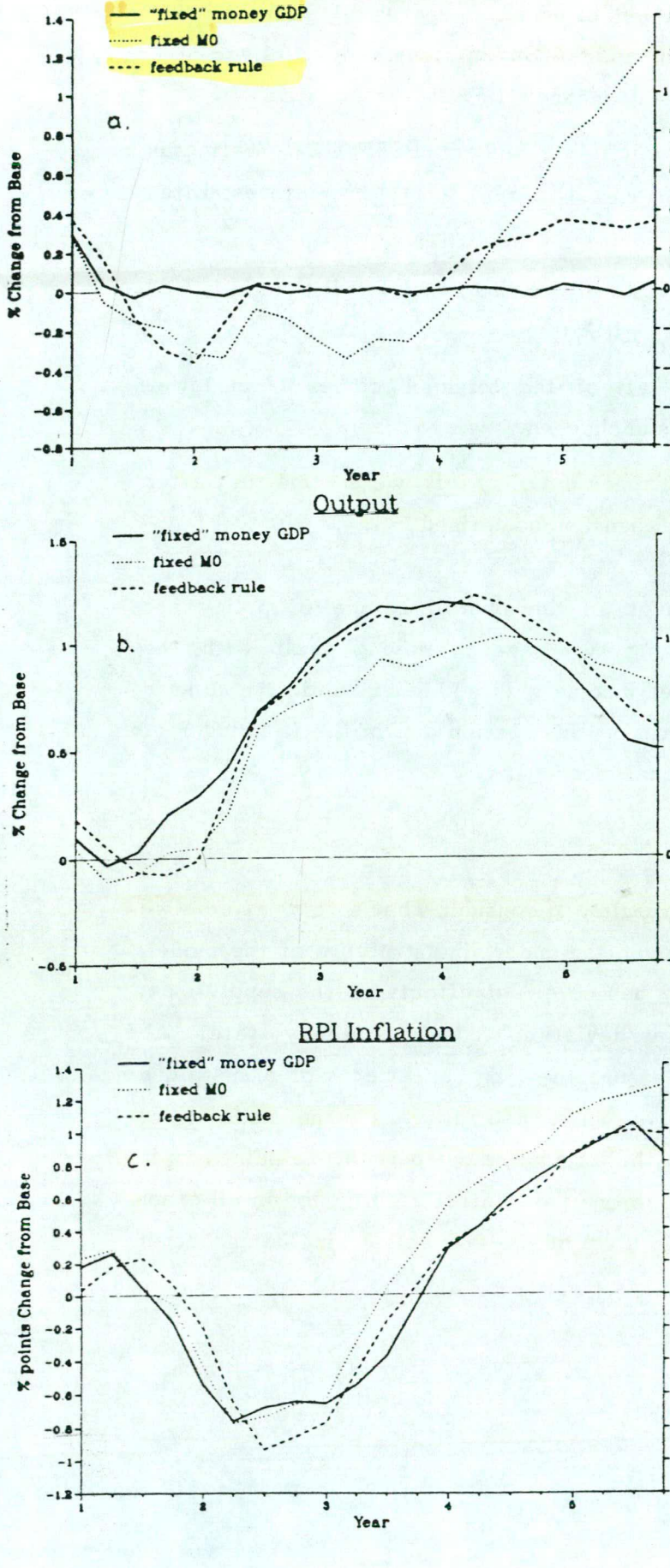
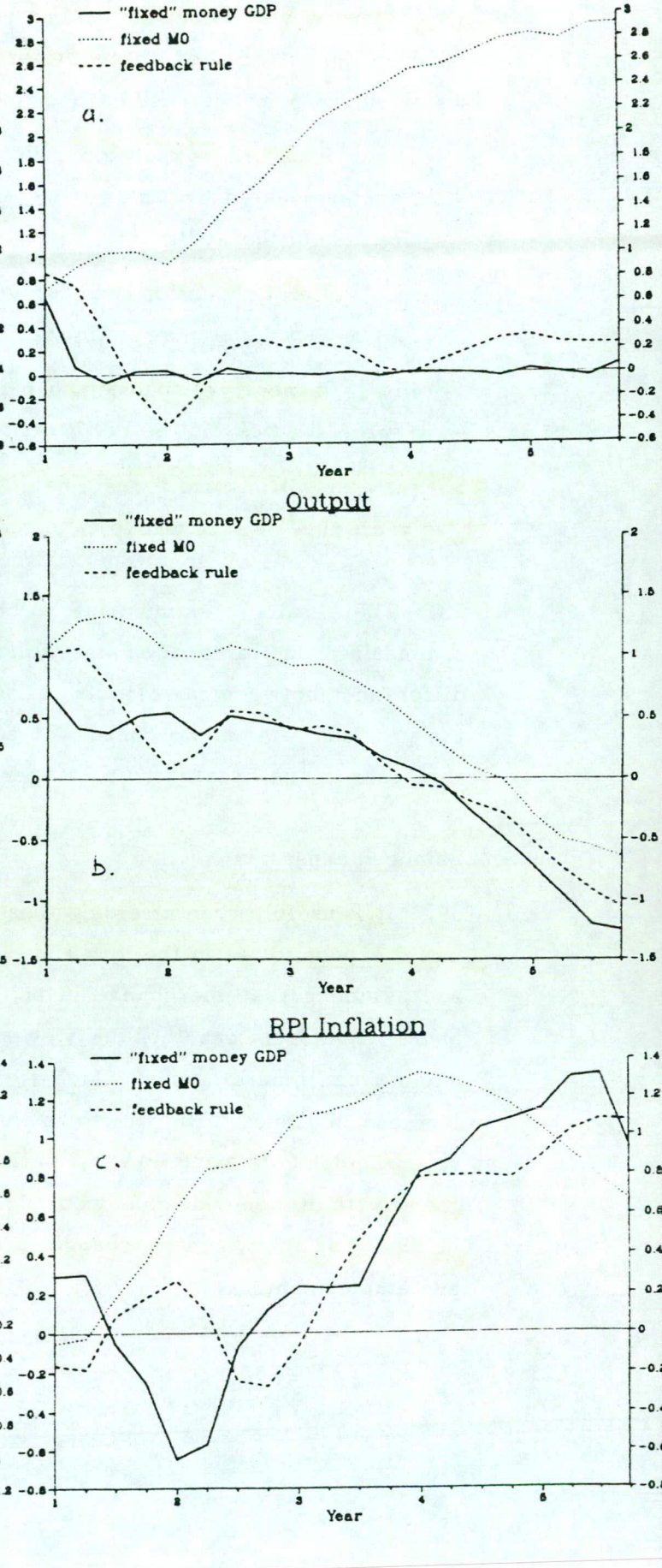


CHART 5:

Higher Public Investment



IV CHANGING THE OVERALL STANCE OF POLICY

57. In this section, we turn to the second class of policy changes - those which involve an overall expansion or contraction of nominal aggregate demand. We consider the effects of three different policy combinations, each delivering a sustained one point increase in the growth of money GDP:

i. balanced expansion, in which a higher PSBR/GDP ratio is accommodated by faster monetary growth (ie real short term interest rates remain unchanged);

ii fiscal expansion, which involves a bigger rise in the PSBR than in i, and a corresponding increase in real interest rates;

iii. monetary expansion, where all of the stimulus comes from lower interest rates and the PSBR ratio is unchanged.

Since ii. and iii. involve unsustainable changes in policy mix, we assume that after five years they each revert to balanced expansion, as defined in i.

58. The results of simulating a change in the overall stance of policy are summarized in Table A on the following two pages. Having dealt with the differences between the effects of lower income tax and higher public spending in the previous section, we confine ourselves in this section and in the remainder of the paper to one fiscal instrument: personal income tax.

Balanced expansion

59. It is useful, when assessing these results, to consider what sort of effects we would expect to see in the long run - given the underlying structure of the model, and assuming that the change in policy has no direct effects on the supply side. Short run effects can then be viewed as deviations from this steady state. An obvious benchmark against which to measure the long run effects of a sustained increase in money GDP growth is that of "super-neutrality". If the model were super-neutral, we would expect that, in the long run, a one percentage point rise in the growth of money demand would lead to one per cent extra inflation in all other nominal variables, and no change in the level of real variables - including output and employment.

FASTER GROWTH IN MONEY GDP

Sustained increase of 1 per cent point in rate of growth of money GDP, using different settings of fiscal and monetary policy

% change from base in:	BALANCED EXPANSION: Fixed real short rates: fiscal policy accommodating	FISCAL EXPANSION*	MONETARY EXPANSION**
REAL GDP (growth rate			
Year 1 in brackets)	+.5 (+.5)	+.6 (+.6)	+.5 (+.5)
Year 2	+.9 (+.4)	+1.2 (+.6)	+.6 (+.1)
Year 3	+1.2 (+.3)	+1.9 (+.7)	+.4 (-.2)
Year 4	+1.1 (-.1)	+2.0 (+.1)	+.5 (+.1)
Year 5	+.8 (-.3)	+1.6 (-.4)	+.7 (+.2)
Year 6	+.7 (-.1)	+1.2 (-.4)	+.9 (+.2)
RPI INFLATION			
Year 1	+.5	+.5	+.3
Year 2	+.8	+.4	+1.2
Year 3	+.8	+.7	+1.2
Year 4	+1.2	+1.6	+.8
Year 5	+1.3	+2.1	+.5
Year 6	+1.1	+1.6	+1.0
EMPLOYMENT			
Year 1	+.2	+.3	+.2
Year 2	+.8	+1.0	+.5
Year 3	+1.3	+2.0	+.5
Year 4	+1.5	+2.7	+.4
Year 5	+1.4	+2.8	+.6
Year 6	+1.2	+2.4	+.8
REAL EARNINGS			
Year 1	-.5	-.7	-.2
Year 2	-1.3	-1.8	-.4
Year 3	-1.4	-2.3	-.4
Year 4	-1.3	-2.9	-.4
Year 5	-1.3	-3.5	-.3
Year 6	-1.3	-3.1	-.6
CURRENT ACCOUNT (£bn)			
Year 1	-1.2	-1.4	-1.1
Year 2	-1.2	-2.6	+.4
Year 3	-1.2	-4.4	+1.4
Year 4	-.5	-4.8	+1.4
Year 5	+.3	-4.1	+1.2
Year 6	+1.0	-1.7	+.6

* 1½ point increase in PSBR ratio for 5 years; then balanced expansion

** Lower interest rates and fixed PSBR ratio for first 5 years; then balanced expansion.

FASTER GROWTH IN MONEY GDP

% change from base in:	BALANCED EXPANSION: Fixed real short rates: fiscal policy accommodating	FISCAL EXPANSION*	MONETARY EXPANSION**
PSBR RATIO OR MO	PSBR/GDP	PSBR/GDP	MO
Year 1	+.9	+1.5	+.9
Year 2	+.8	+1.5	+1.4
Year 3	+.4	+1.5	+1.7
Year 4	+.2	+1.5	+2.5
Year 5	+.3	+1.5	+3.9
Year 6	+.4	+.8	+5.3
S-T REAL INTEREST RATES			
Year 1	0	+.7	-1.0
Year 2	0	+.4	-.6
Year 3	0	+1.1	-.5
Year 4	0	+1.8	-.8
Year 5	0	+2.6	-1.1
Year 6	0	0	0
L-T INTEREST RATES			
Year 1	+.8	+1.5	-.2
Year 2	+.9	+1.6	-.2
Year 3	+.9	+1.7	-.2
Year 4	+.9	+1.7	-.2
Year 5	+.9	+1.6	0
Year 6	+.9	+1.4	+.1
NOMINAL EXCHANGE RATE			
Year 1	-2.7	-1.7	-3.5
Year 2	-3.3	-2.5	-3.5
Year 3	-3.9	-3.0	-4.1
Year 4	-4.7	-4.0	-5.2
Year 5	-5.7	-5.6	-5.9
Year 6	-6.8	-8.0	-6.4
REAL EXCHANGE RATE			
Year 1	-2.7	-1.6	-3.5
Year 2	-2.7	-2.3	-2.4
Year 3	-2.6	-2.6	-2.1
Year 4	-2.4	-2.7	-2.3
Year 5	-2.3	-3.0	-2.4
Year 6	-2.4	-3.7	-2.3

60. The conditions for full super-neutrality are very strong (see Marini and van der Ploeg (1987)), and are unlikely, particularly in a large econometric model like the Treasury's, to be satisfied. The existence of a non-interest bearing outside asset (cash), for example, is sufficient to prevent super-neutrality; as is the inclusion in the model of a number of exogenous nominal variables (see Wallis and Whitley (1987)).

61. But some of these conditions are more important than others, and there are a number of key respects in which the model we are using does approximate to the super-neutral paradigm :[17]

i. nominal interest rates are changed in line with inflation, by assumption;

ii. with rational expectations, fixed real interest rates and a high degree of substitutability between foreign and domestic assets, the exchange rate equation is close to being dynamically homogeneous (of degree one) in domestic prices;

iii. the earnings equation and most of the price equations in the model are, themselves, dynamically homogeneous;

iv. the price and earnings equations also include pressure-of-demand terms, suggesting no long run hysteresis (see Nickell (1987));

v. the terminal conditions prevent persistent disequilibria in the balance of payments and the term structure of interest rates;

vi although real cash holdings will fall in response to higher nominal interest rates, cash is only a small proportion of total financial wealth (and even of personal sector liquid assets), so any effect on real consumption is likely to be minimal; and there is no direct link in the model between cash balances and aggregate supply;

vii as explained earlier, the Treasury model does not incorporate any supply side effects from changes in the level of the capital stock (which may occur in the process of adjustment towards long run equilibrium); nor from changes in the level of inflation, eg to the extent that higher rates of inflation may impair market efficiency or adversely affect business confidence.

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17 This is probably more true of our amended model than of the Treasury model itself, since points i, ii and v. are special to this exercise. However, it must be emphasised that in neither case are all the conditions for super-neutrality met, and it would be wrong to draw any precise conclusions about the long run from the rather general observations we are making here.

62. This list encompasses the most important influences on long run model properties. It is not particularly surprising, therefore, that the results in column 1 of Table A show signs of tending towards an equilibrium in which, after allowing for beneficial retention ratio effects real variables are more or less unchanged - although, by year 6 the process of adjustment is by no means complete. The signs include:

- a gradual decline in the GDP response, from its peak in year 3;
- inflation just over one per cent above base by year 6; we would expect the increase to remain at over one per cent until output returns to base levels;
- a rise in the PSBR ratio of just under ½; this is consistent with an unchanged debt-income ratio in the long run (since the debt-income ratio in the base is around ½);
- long term interest rates rise by close to one point, almost immediately;
- from about year 4 onwards, the nominal exchange rate depreciates by almost exactly one per cent faster than in the base, reflecting a similar rise in short term interest rates.

63. Against this background, the short term effects of balanced expansion - in particular, the temporary rise in real output - reflect stickiness in the domestic inflation process. The most important element in this is the tendency, as a lower exchange rate pushes prices up, for earnings to lag behind so that real wages fall for a time. This effect is augmented by a rise in the retention ratio, because of lower income tax.

64. The resulting increase in output sucks in imports and causes the current account to deteriorate, ex ante. With less than perfect capital mobility, the relative return on sterling assets has to rise in order to generate the required capital inflow. Since, by assumption relative real interest rates are fixed, this necessitates an expected appreciation in the real exchange rate. The change in the equilibrium real exchange rate is likely to be small,[18] and the initial response is therefore a downward jump in the real exchange rate, followed by gradual appreciation. This is evident in Table A.

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18 The closer the long run equilibrium is to a super-neutral equilibrium, the smaller the change in the real equilibrium exchange rate.

"Unbalanced" expansion

65. We suggested in section III that a temporary change in policy mix will not significantly alter the steady state equilibrium of the economy. It follows that the long run effects of a change in the overall stance of policy, such as they are, will be more or less unaffected by the inclusion of a simultaneous, temporary, change in policy mix.

66. Similarly, the short term effects of what we have called "fiscal expansion" and "monetary expansion" can be thought of as the effects of a balanced increase in money GDP growth plus or minus (respectively) some element of looser fiscal policy and tighter monetary policy. From section III, we know that this last combination produces a temporary increase in output and reduction in inflation (for given money GDP), because of;

- a stronger exchange rate, and
- the direct effects of income tax cuts on earnings.

Consequently, a stimulus to demand which is biased towards looser fiscal policy and higher real interest rates ("fiscal expansion") will raise output by more in the short run, and inflation by less, than balanced expansion. The reverse is obviously true for monetary expansion.

67. There is one particularly striking feature of the results in Table A that was not discussed in the context of policy mix changes, namely the extent to which the gap between output responses and employment responses varies according to the mix of policy. This reflects the importance of relative factor prices in determining average labour productivity, as Chart 6 suggests.

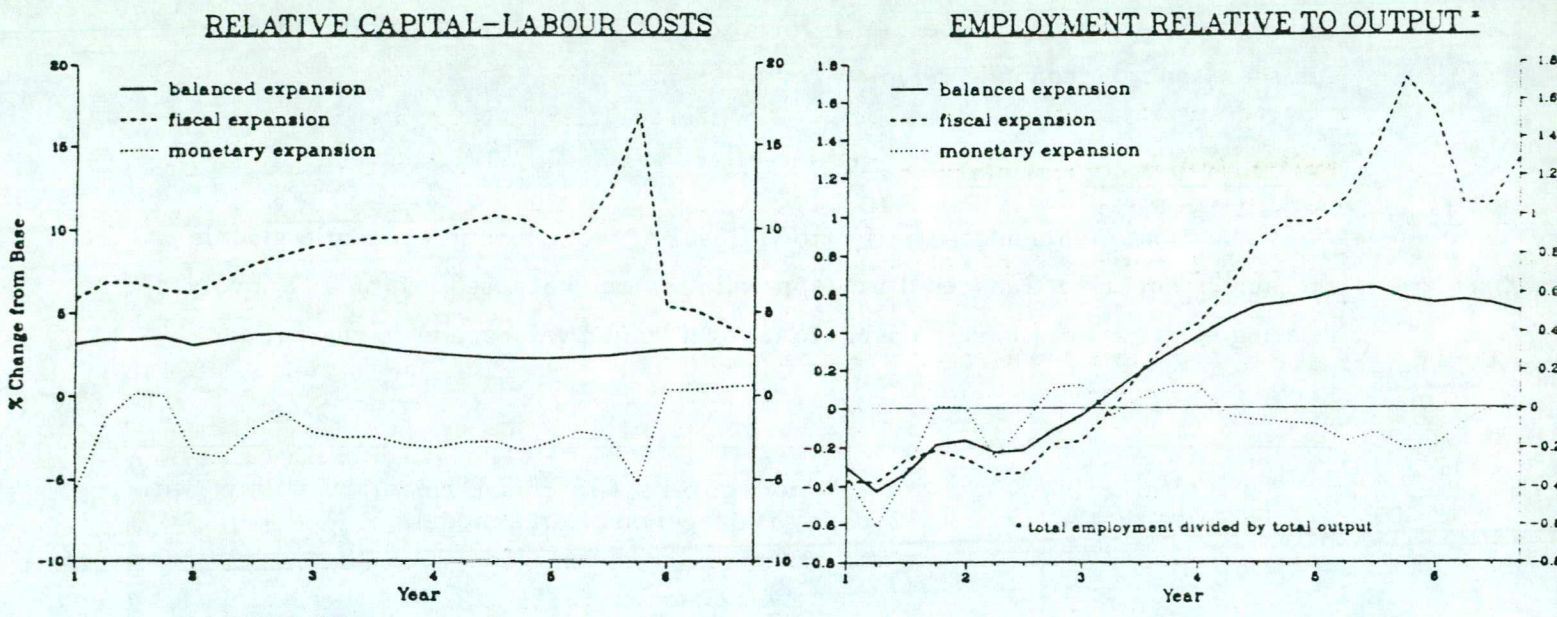

CHART 6

68. A shift towards looser fiscal policy (as specified here) tends to reduce real labour costs, because income taxes are lower, and to raise the real cost of capital, because the general level of interest rates is higher. Relative capital-labour costs rise on both counts, inducing firms to produce a given volume of output with more labour and less capital. This effect is initially outweighed in simulations by the tendency for employment to lag behind output (productivity being pro-cyclical), but is clearly evident after about three years of fiscal expansion. In the long run we would expect relative factor prices, and both output and employment, to return more or less to base levels.

V ALTERNATIVES TO CONSISTENT EXPECTATIONS

69. As we implied in section I, the assumption of consistent expectations comprises two distinct propositions;

i. that markets know the "true" (ie our) model of the economy, and use this to form their expectations;

ii. that markets know with certainty the future paths of the exogenous variables, including the settings of fiscal and monetary policy.[19]

70. The first proposition requires that agents are rational, and that information costs are not so large as to prevent them either using the full model themselves or, more plausibly, acting as if they did (eg by basing expectations on published, model-based, forecasts). We would argue that, for practical purposes, it is reasonable to assume that these requirements will be met. But it is interesting nevertheless to consider how the results we have discussed so far might be affected if agents were to use some much simpler mechanism for the formation of expectations - one which does not involve, directly or indirectly, the solution of a full scale macro-economic model.

Backward-looking expectations

71. The most common alternative to rational expectations in economic models is the single equation, reduced form approach which, because it typically involves relating each expectational variable to its own lagged values, and to current and

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19 or, alternatively, the rules which govern fiscal and monetary policy; we assume that at some level, policy is exogenous to the model.

past values of other relevant economic variables, is usually labelled backward-looking expectations.[20] The Treasury model includes equations of this sort for the expected exchange rate and the expected long term interest rate;

$$\Delta RX^e = f\left(\Delta\left(\frac{M3^*}{M3}\right),\ \Delta\left(\frac{ULC^*}{ULC}\right),\ \Delta\,(r - r^*),\ \Delta NSO,\ \frac{RX}{RXQ}\right)$$

$$R^e = g\left(R,\ r,\ \dot{P}^e,\ \frac{PSBR}{NW}\right)$$

where;

RX	=	effective exchange rate
ULC	=	unit labour costs
r	=	short term interest rate
NSO	=	real value of North Sea oil reserves
RXQ	=	equilibrium exchange rate
R	=	long term interest rate
P	=	domestic price level
NW	=	net private sector financial wealth
*	=	world variable
e	=	one-period-ahead expectation

72. Charts 7 and 8 compare the results of two consistent expectations simulations (one of a change in mix, the other of a change in stance) with simulations of the same policy changes but with the alternative assumption of backward-looking expectations, based on these equations. Consider first the effects of a change in stance, since the differences here are fairly straightforward.

73. It should have become apparent by now, from the discussion in the previous section, that the importance of expectations in the Treasury model lies mainly in the link between the exchange rate and domestic prices. The combination of forward-looking expectations and a flexible exchange rate effectively speeds up the transmission between inflationary shocks (eg changes in policy stance) and increases in the actual inflation rate.

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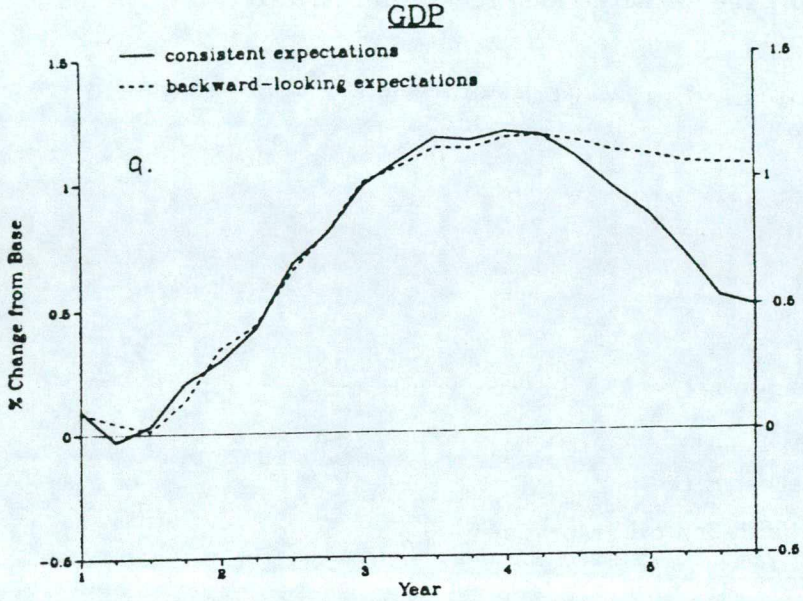
20 the distinction between rational and backward-looking expectations is a useful one in this context, even though it can be shown (Muth (1961)) that in some cases the two may concide (ie backward-looking expectations may be unbiassed).

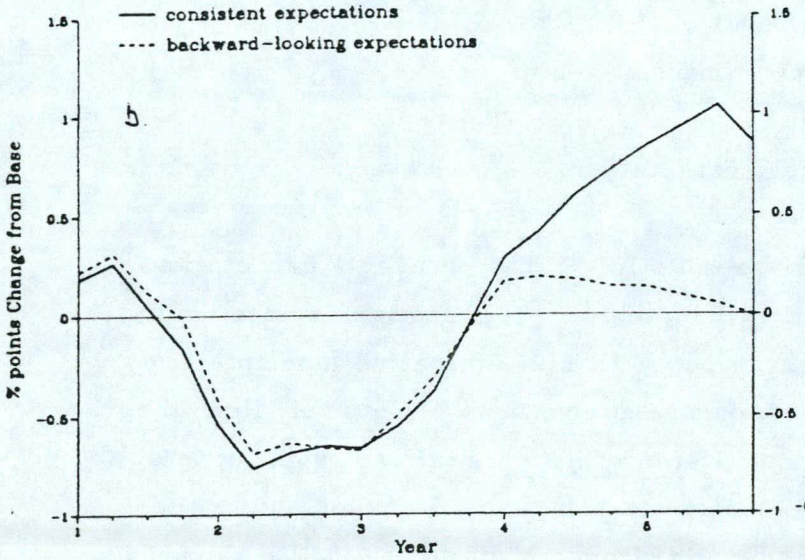
CHART 7

Change in "mix"

GDP



RPI INFLATION



NOMINAL EXCHANGE RATE

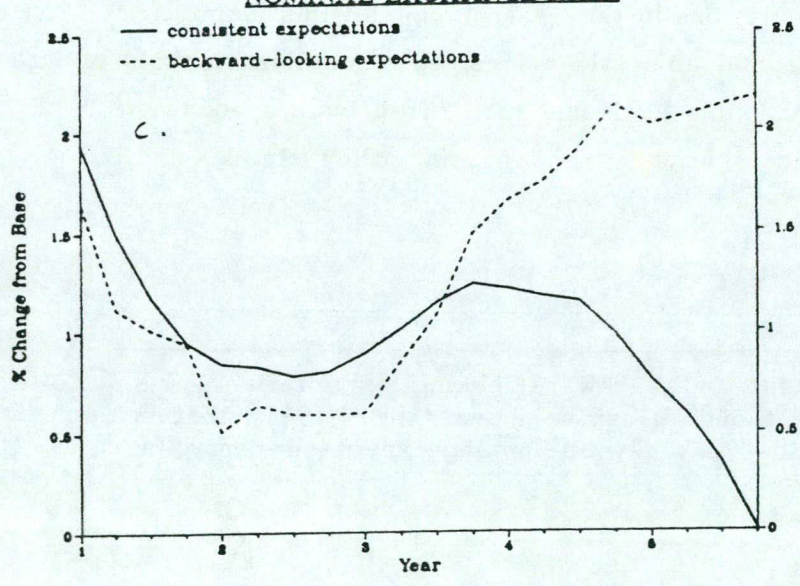
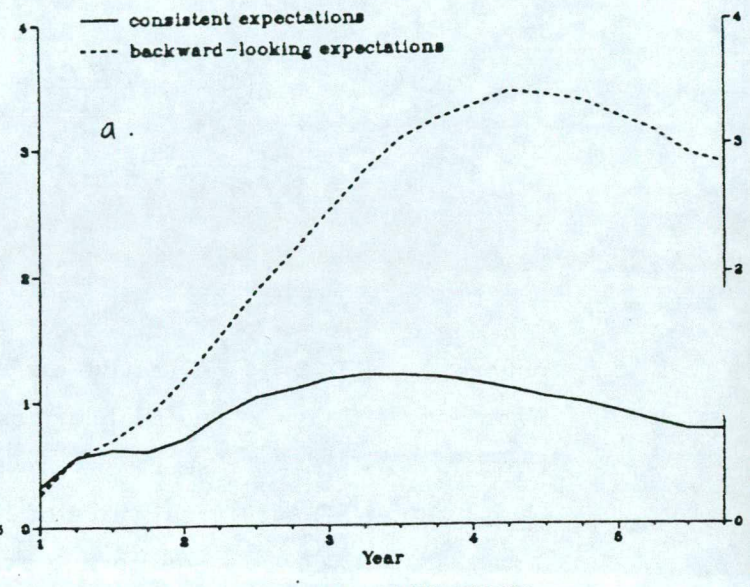


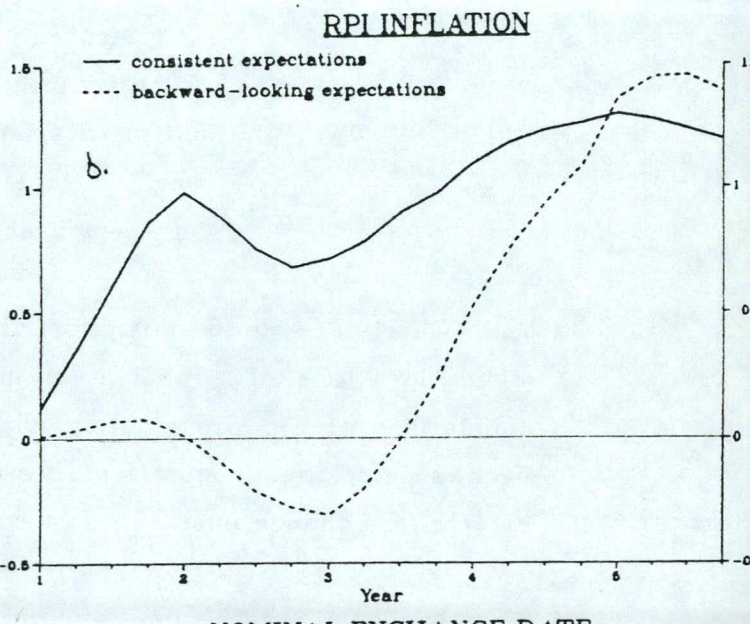
CHART 8

Change in "stance": balanced expansion

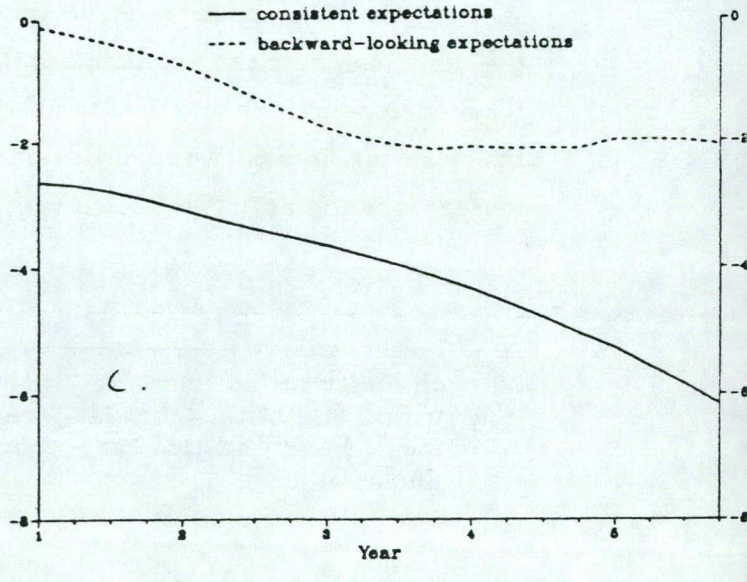
GDP



RPI INFLATION



NOMINAL EXCHANGE RATE



74. On the other hand, the contrast between the flexibility of the exchange rate and the stickiness of domestic costs tends to be much less significant when expectations are backward-looking. In these circumstances, the exchange rate will only reflect a change in inflationary pressure as and when that change becomes evident - either in domestic inflation itself or in indicators of inflationary pressure such as monetary growth, or a deteriorating current account.

75. This is evident in Charts 8b and 8c, where the assumption of backward-looking expectations rules out any initial jump in the exchange rate, and as a result the effect on inflation takes almost four years to catch up with that under consistent expectations.[21] The counterpart to this, of course, is that output rises by much more, and stays higher for longer, than when expectations are consistent (see Chart 8a).

76. Turning to the effects of a change in policy mix, it is remarkable, by contrast, how little difference the expectations assumption makes - particularly in the first three years or so of the simulation. The main reason for this is that a change in policy mix which is eventually reversed does not imply a change in either the equilibrium price level or its rate of change. In principle, the exchange rate ought not to be much affected by the difference between agents "looking forward" and seeing no change, and them not looking forward at all. In the short term, however, the main influence in both cases is that of short term interest rates, the effects on which are shown in Chart 9.

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21 In the steady state, most expectations formation mechanisms will produce convergence between actual and expected values, so that these differences will disappear. In practice, the backward-looking expectations equations in the Treasury model may not converge on consistent expectations because there is nothing to ensure that the equilibrium exchange rate (RXQ) will restore basic balance.

Changes in short term interest rates

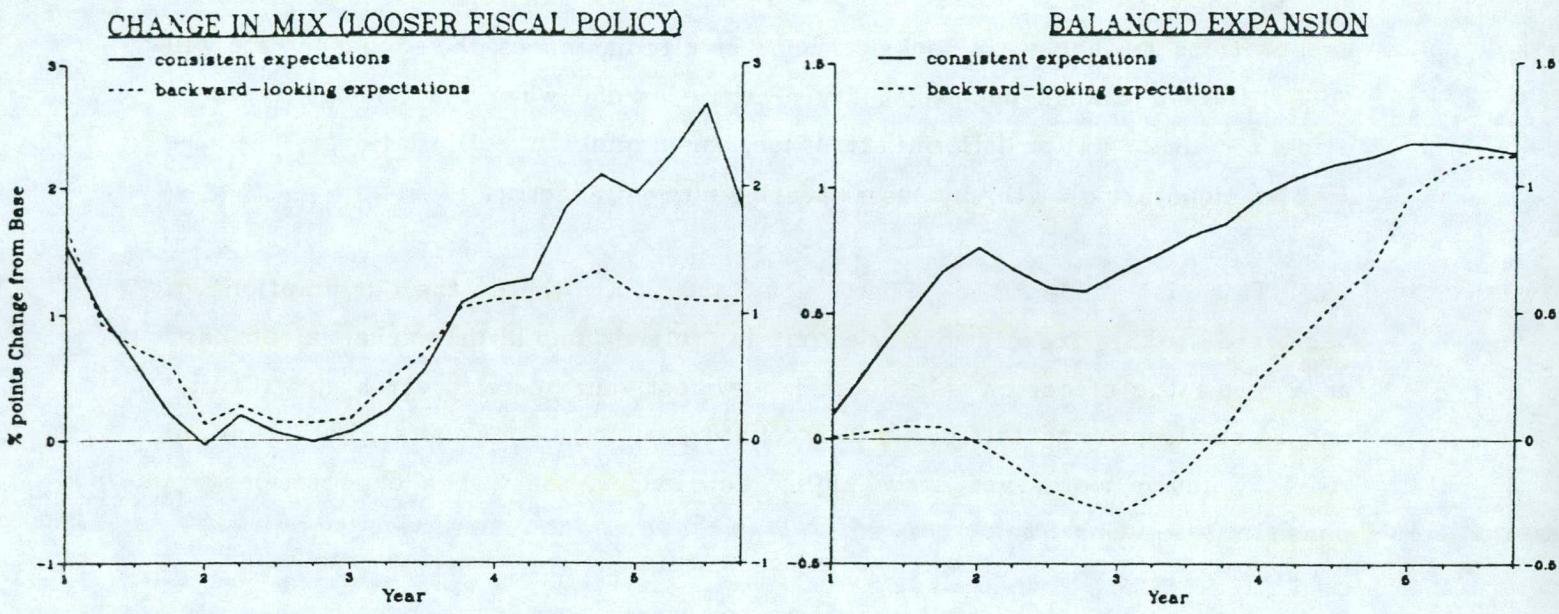

CHART 9

77. With backward-looking expectations, the model equation implies that the exchange rate path more or less matches that of short term interest rates, giving the U-shaped response shown in Chart 7c. With consistent expectations the nature of the link between the exchange rate and interest rates is quite different - depending, as explained earlier, on the interest parity condition plus a risk premium. Over the first three years of the simulation it coincidentally implies the same shape of exchange rate path: higher, but falling, interest rates mean an exchange rate depreciating, but at a decreasing rate. Beyond year 3, however, the similarity breaks down. Under backward looking expectations, the exchange rate rises in line with interest rates; under consistent expectations, it must depreciate and at an increasing rate.

78. Charts 7a and 7b bear out the now familiar result that effects on output and inflation correspond closely to differences in the exchange rate response. Up to the end of year 3, the differences under the two expectations assumptions are negligible. Thereafter, consistent expectations imply a lower exchange rate, and hence higher inflation and lower output. The discussion in the previous paragraph, however, suggests that these effects will be critically dependent upon the profile of interest rate changes in the simulation. Unlike the case of a change in overall policy stance, therefore - where the clear conclusion emerged that forward-looking expectations tend to reduce the output effects of changing

aggregate demand - the influence of differing expectations regimes for a change in policy mix will be highly model-dependent.

"Imperfect Foresight"

79. The assumption that private sector expectations are forward-looking, and based on an economic model similar to that of the policy maker, can be justified to the extent that the two sets of participants share a common information set. But when it comes to the policymakers' intentions with regard to the setting of policy, the private sector is at a disadvantage in two respects;

i. even if, as we have assumed, policy intentions are made public, agents cannot be sure that those intentions are genuine, or that the intended policy can in fact be implemented;

ii. if the announced policy implies a fiscal-monetary mix which is unsustainable from the outset, the private sector has to make some prediction as to how and when policy will be re-aligned. Their job is made more difficult by the fact that policy makers would not normally announce re-alignment in advance.

80. In both cases, the implication is that the private sector, despite having the "right" model with which to assess policy changes, may nevertheless form inconsistent expectations to the extent that their assumptions about policy turn out to be incorrect.

81. Consider first the case where a sustainable policy change is announced but, initially, is not believed.[22] The classic example is a policy change which is "time inconsistent", ie where the private sector suspends belief because they know that the authorities have an incentive to renege. In these circumstances, it is possible that the policy will only gain credibility as and when it is seen to have been implemented.

82. The authorities are assumed to announce and implement a sustained one per cent reduction in the growth rate of money GDP. The private sector initially (ie in the first quarter) discounts the announcement altogether, leaving its forecasts of output, inflation, exchange rates and so on unchanged. Over the subsequent two years, however, it gradually updates its forecasts, giving an

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22 The effects would be similar for an announced policy change which was believed but not implemented, ie if the authorities "cheat".

increasing weight to the government's initial announcement, so that by the beginning of year 3 the policy change is fully credible.[23]

83. Chart 10 compares the effects of this scenario ("learning") with one in which the same policy change is believed from the outset, ie where expectations are consistent (as in table A, but with signs reversed). Not surprisingly, the expectational variables - the exchange rate and the long term interest rate - respond quite differently in the two cases, until full credibility is established. More surprising, perhaps, given that convergence is relatively quick, is the extent to which the effects on output and inflation differ:

- with consistent expectations, inflation is reduced by one per cent within 12 months (though it cycles somewhat thereafter); with less-than-full credibility, the same reduction takes almost three years;
- the output cost of reducing inflation is increased significantly when expectations take time to respond; at its trough, the reduction in output is almost twice as big as under consistent expectations.

84. The explanation for this lies mainly in the fact that the exchange rate tends to be higher the greater the credibility of the government's commitment to reducing money GDP growth (and, by implication, the rate of inflation). In the "learning" case, the exchange rate is therefore lower for a year or so than if the policy change had been fully credible from the start. This also means that income taxes have to be raised by more to deliver the same reduction in money GDP growth. The combination of a lower exchange rate and an adverse retention ratio effect on earnings growth slows down the transition to lower inflation, with a correspondingly bigger (temporary) output loss. Associated with this is a greater degree of undershooting in the inflation rate from about year 4 onwards, as the effects of recession on wage growth and other domestic costs combine with those of revised expectations in the foreign exchange market.

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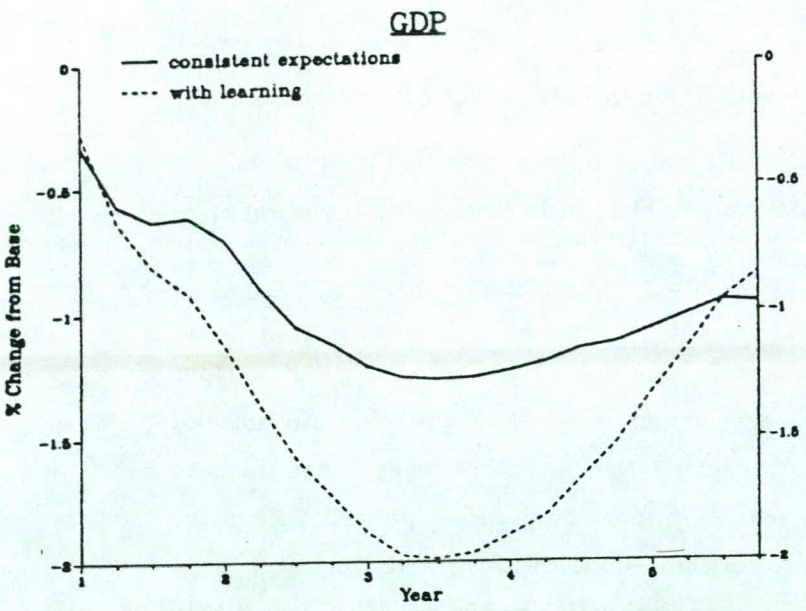
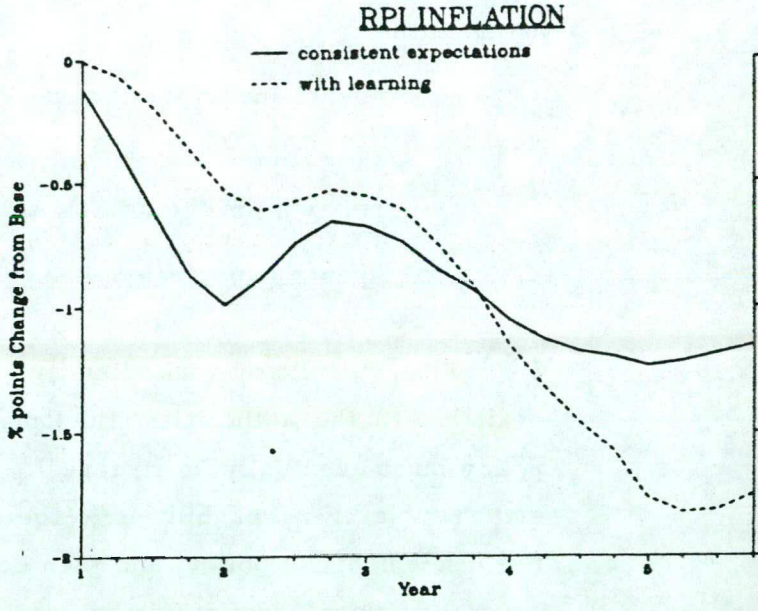
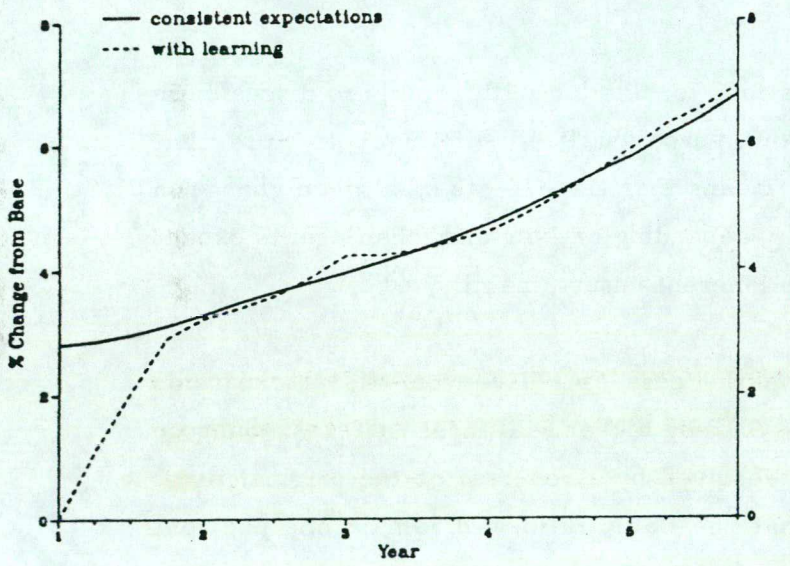
23 For simulation purposes, this process is assumed to be linear; see Cooper and Young (1987) for a fuller description of the methodology.

Effects of a 1 per cent reduction in money GDP growth







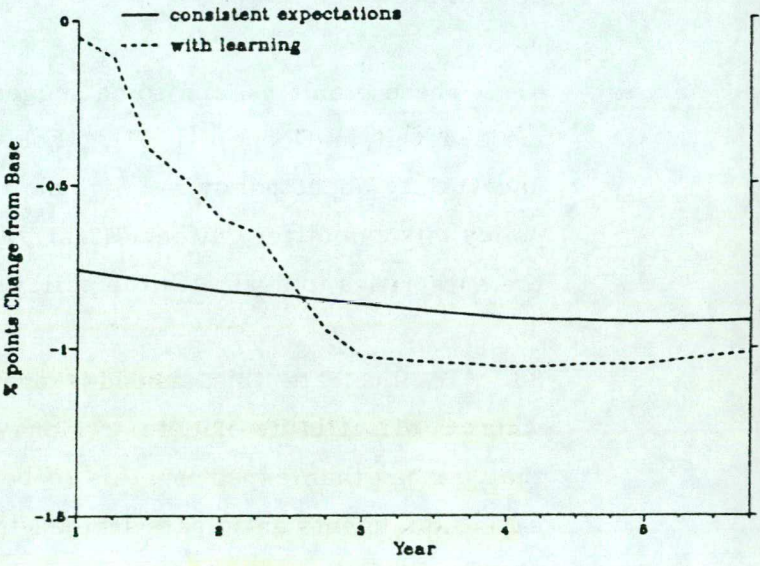


CHART 10

85. The second case in which actual and expected policy changes may diverge is when the initial policy change has to be amended at some point in the future, because it incorporates an unsustainable shift in policy mix. So far, we have assumed that;

i agents anticipate that policy re-alignment will occur after five years;

ii. they expect that it will take the form of a reversion to the same mix of policy as on the base, with no further change in overall policy stance;

iii. agents' expectations are fully realized.

86. Clearly, full reversal after five years is only one of a whole range of options available to the authorities (the only restriction being that the original mix of policy must eventually be restored). In practice the best that agents can do is to attach subjective probabilities to the various options, deriving expected values for the instruments of policy, and then construct an economic forecast based on those expected values. As time progresses, some options will appear more or less likely (and some may be eliminated altogether), so that agents will be continually updating their forecasts. In the event, of course, these forecasts may or may not be realized.

87. These problems, and some suggestions for dealing with them, are discussed in more detail in Cooper (1987). For our purposes, it is sufficient to note that uncertainty about policy re-alignment means that the effects of a given change in policy mix can differ quite substantially, depending on how and when agents expect the authorities to deal with the policy's inherent unsustainability.[24]

88. To illustrate this, consider again the case of a five year fiscal expansion which is offset in its effects on money GDP by higher real interest rates. Suppose that, rather than expecting this to be resolved by a reversal of the original fiscal expansion, agents anticipate instead that the PSBR ratio will remain one per cent higher indefinitely, and that from year 6 onwards this will be accommodated by faster growth in money GDP.[25]

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24 In practice, of course, agents may anticipate re-alignment even when a policy is theoretically sustainable - for example, on account of political factors (the electoral cycle etc). This possibility is not considered here.

25 ie real interest rates return to base levels.

89. The result is that, even though over the initial period both the stance and the mix of policy are exactly the same in the two scenarios, the expectation that the higher PSBR will eventually be accommodated rather than reversed is sufficient to reduce the temporary output gains from the change in mix, with correspondingly higher inflation (see Chart 11). The medium for this is a lower exchange rate. Fiscal expansion still implies an initial upward jump in the exchange rate, but the anticipation of a higher long run inflation rate reduces the size of that jump (fractionally) and implies a faster rate of depreciation thereafter - the fall in the exchange rate accelerating as the expected relaxation of policy approaches.

90. The difference in the size of the initial upward jump in the exchange rate is small because currency markets are assumed to attach some weight to contemporaneous current account imbalances (see paragraph 34). These imbalances are, initially, very similar in both cases. If, however, domestic and foreign assets were regarded as perfect substitutes - so that the exchange rate was determined solely by its expected long run equilibrium value and the path for short term interest rates - more of the eventual fall in the exchange rate would be brought forward[26], implying a smaller upward jump (or possibly even a downward jump). This of course would reduce the short run increase in output still further.

91. To summarize, we can say that the rise in the exchange rate, and the associated (temporary) output gains from a shift towards looser fiscal policy and tighter monetary policy will tend to be smaller:

a. the greater the expectation that the fiscal expansion will eventually be accommodated,

b. the sooner that accommodation is expected to occur, and

c. if monetary accommodation is expected, the greater the degree of forward-lookingness in the foreign exchange markets.

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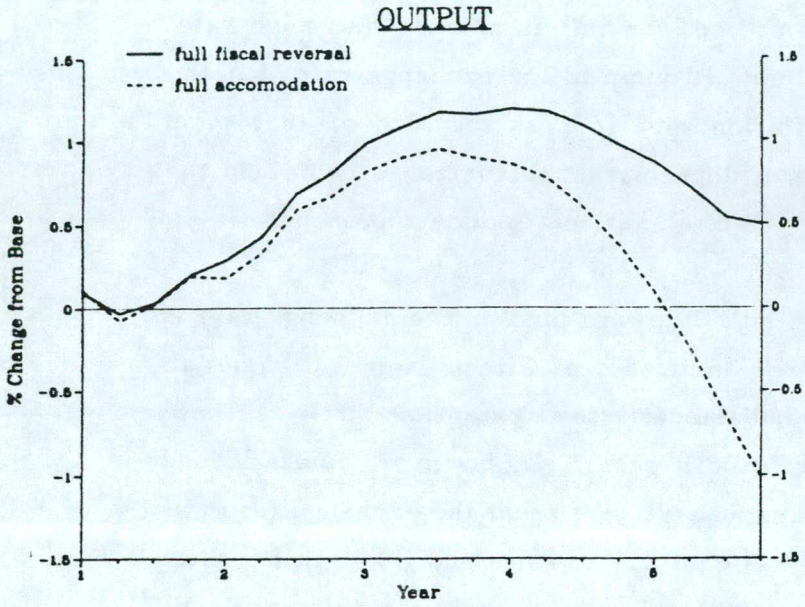
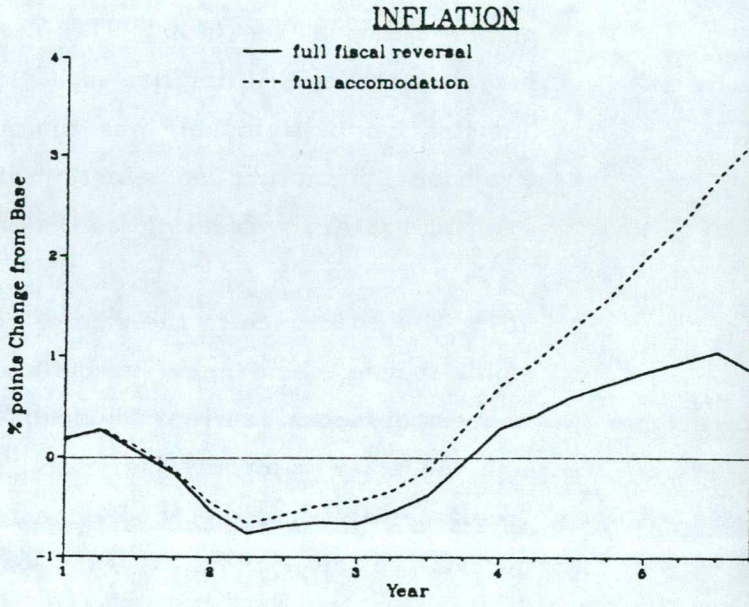
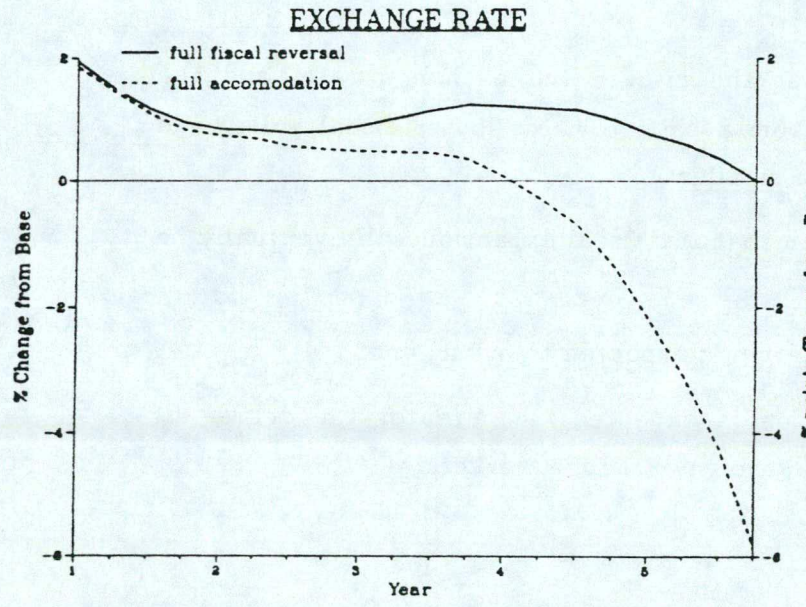
26 In technical terms the forward-looking root in the exchange rate equation would be increased.

Effects of 1 per cent increase in the PSBR/GDP ratio with unchanged money GDP







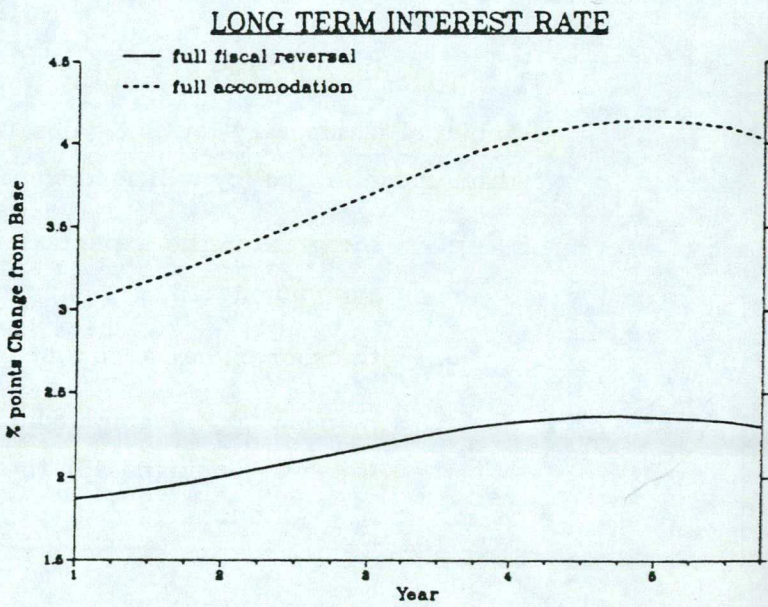


CHART 11

92. The effect on long term interest rates is less clear cut; they will tend to be higher the greater the degree of expected accommodation (because of higher expected inflation); but will also rise by more the longer the period of non-accommodation because the debt-income ratio rises by more.[27] In Chart 11, of course, re-alignment occurs at the same point in both cases, and so anticipated accommodation unambiguously generates higher long term interest rates (one implication of which, harking back to the discussion in section III, is that relative capital - labour costs rise, and employment gains are therefore less affected than output gains by changes in expectations).

93. Our intention in this section has been to echo the message of the theoretical literature, that expectations are crucially important in determining the effects of changes in macroeconomic policy. The simulation results confirm that;

- for a change in overall policy stance, the effects on output are reduced (and on inflation, increased) if the change is announced, if it is believed and if markets adjust their forecasts rationally with the benefit of full information. The corollary is that if expectations are relatively inert, if policy changes are not credible, or if the authorities cheat, more of any given change in demand will be reflected in a temporary change in real output, less in inflation;

- for changes in policy mix, the most important factor is the extent to which markets anticipate that a change in mix heralds some future change in stance: so long as the "fixed nominal framework" is intact, and expected to remain so, the backward-lookingness of expectations (or otherwise) is of much less significance.[28]

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27 Virtually by definition, a balanced policy (ie with accommodation) implies a stable debt-income ratio; the changing debt-income ratio generated by fiscal expansion with unchanged money GDP is one reason why such a policy may not be sustainable.

28 Intuitively, this is because with fixed money GDP the long run levels of output and prices are effectively pinned down; it is only when policy involves significant future changes in these variables that forward-looking expectations are of fundamental importance.

VI EFFECTS OF PARAMETER CHANGES IN SOME KEY MODEL RELATIONSHIPS

94. The two main issues dealt with so far in this paper - the policy framework and expectations - can both be represented as modelling issues, in the sense that they involve substituting one model relationship, or set of relationships, for another.[29] In this penultimate section, we consider the effects of amending a number of other relationships, concentrating on those which are most likely to have a major influence on overall model properties.

95. It should not be inferred from this that we believe the equations in question to be mis-specified. Nor do the amendments we make necessarily have any empirical justification - though, where possible, we try to keep parameter changes within 95 per cent confidence intervals, as originally estimated. The point of the exercise is to acknowledge that behavioural relationships are measured with error (sampling error, at least), and that a complete analysis of policy changes should include an assessment as to how dependent the central estimates are on particular parameter values. The weaker the empirical evidence for an estimated relationship is, the more cautious one has to be about simulation results which rely heavily on the parameters of that relationship.[30]

96. We therefore look again at the effects of a sustained increase in money GDP growth, using a balanced combination of fiscal and monetary expansion, when:

i. in the earnings equation, pressure-of-demand effects are twice as powerful as in the Treasury model,

ii. the retention ratio effect on earnings is eliminated,

iii. trade volumes are twice as responsive to changes in competitiveness and

iv. the degree of international capital mobility (or the degree of substitutability between domestic and foreign assets) is reduced.

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29 In the case of the policy framework, we are mostly replacing exogenous instruments with exogenous targets (so that the instruments are effectively endogenized).

30 Similarly, the greater the influence of a relationship on overall model properties, the more effort one should invest in trying to identify its "true" parameters.

Earnings

97. The equation which determines the level of earnings in the manufacturing sector (and hence, by assumption, all other earnings in the economy) is one of the most important in the model. In addition to its role in the inflation process, the behaviour of earnings also effects international competitiveness (the real exchange rate) and the equilibrium level of employment.

98. Of those factors influencing real earnings, two have been alluded to already in this paper: the level of unemployment and the retention ratio. The presence of a term in unemployment in the earnings equation points towards (though it does not guarantee, nor is it a necessary condition for) a vertical long run Phillips curve - the position of which (ie the NAIRU) is determined by, amongst other things, the level of the retention ratio.

99. Consider first the influence of unemployment. The coefficient on the unemployment term in the earnings equation is fairly small - a one percentage point rise in unemployment, from current levels[31], reduces real earnings by only about ½ per cent in the long run. This suggests that pressure-of-demand in the labour market contributes little to the process by which the economy adjusts to exogenous shocks. Unsurprising though this may be in the light of historical experience, it is nevertheless worth considering how much more or less adjustment would be implied by an incremental change to the pressure-of-demand term in the earnings equation.

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31 The term in unemployment is non-linear, relating the log of earnings to the log of the unemployment rate, and so the initial level of unemployment affects the elasticity.

1 per cent faster money GDP growth: more "responsive" labour market

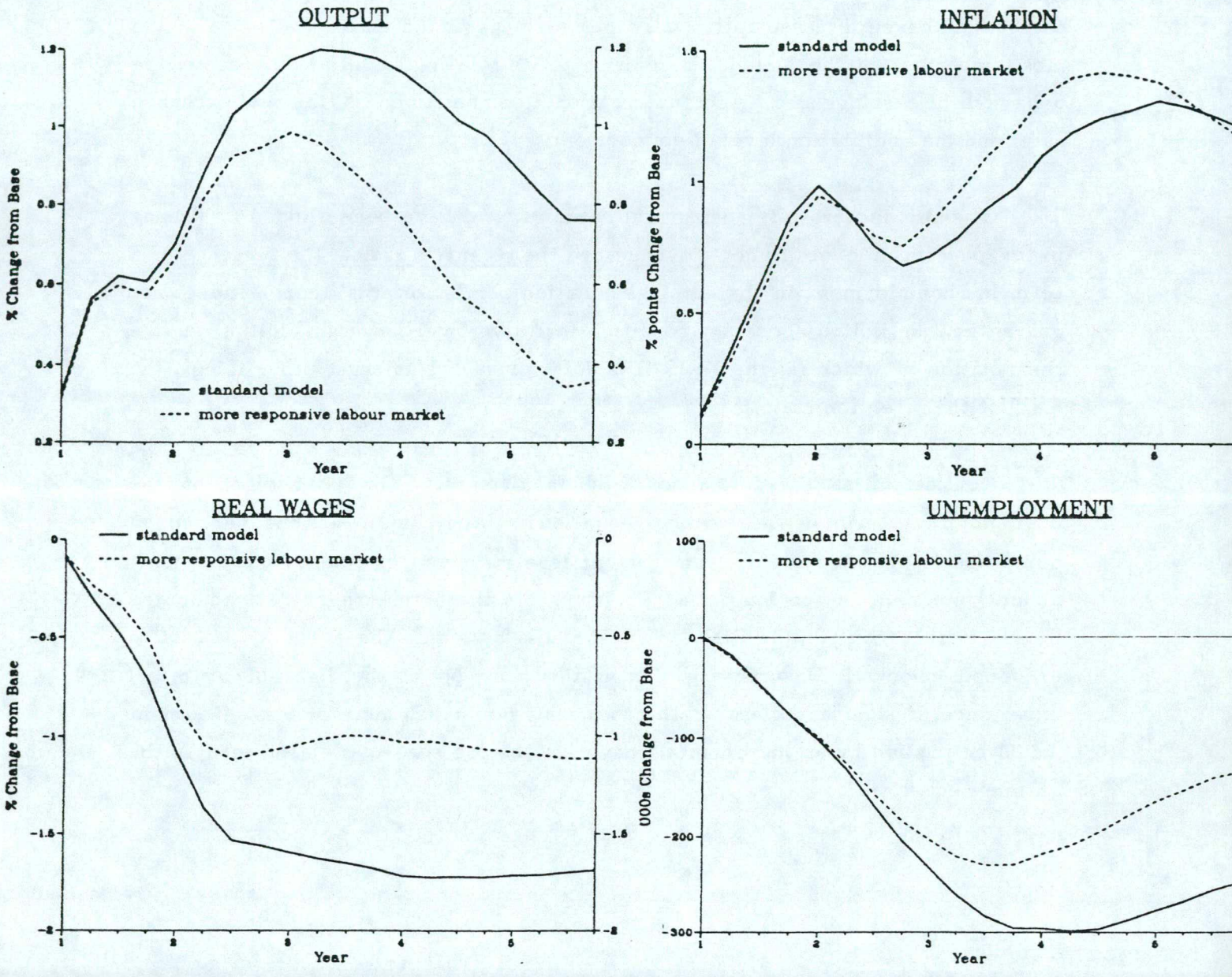

CHART 12

100. In fact, the estimated standard error on this term (see Rowlatt (1986)) is sufficient to allow us to double its coefficient without exceeding the 95 per cent confidence bounds - implying a significantly steeper short run Phillips curve. The impact of this on the effects of a balanced expansion are shown in Chart 12.

101. As we would expect, the increase in aggregate demand translates more quickly into higher inflation the greater the response of earnings to lower unemployment. The peak increase in output is reduced by about 20 per cent, and the peak reduction in unemployment by almost one quarter. The effect on unemployment is greater than that on output precisely because the emphasis is on improved labour market flexibility; faster adjustment in the economy as a whole is augmented by faster adjustment in the labour market relative to other markets.

102. The second variant we consider is one in which real earnings are unaffected by changes in the retention ratio. (Recall from section IV that balanced expansion involved a real reduction in personal income tax, and that the feed-through from this to lower wage demands was one reason for the improvement in the output - inflation split). Again, this variant can be justified empirically, in as much as the data are unable to distinguish, at the 5 per cent level, between the model coefficient and a coefficient of zero.

103. Chart 13 shows how the absence of a retention ratio effect reduces the peak increase in output resulting from faster money GDP growth by roughly 50 per cent. Indeed, within less than five years, the real output effect has disappeared altogether - whereas in our "main case" (ie including the retention ratio effect) crowding out is only half-complete by this stage.

104. Without the retention ratio effect, differences between the effects of income tax cuts and public spending increases are likely to be much smaller, and can be attributed entirely to different short-run multiplier effects, as described in section III.

105. Note that we could, in principle, take out some of the microeconomic effects of changes in other types of tax (analogous to eliminating the retention ratio effect). In all cases, the result will be convergence in the effects of a given change in fiscal stance using different fiscal instruments.

1 per cent faster money GDP growth: no retention ratio effect

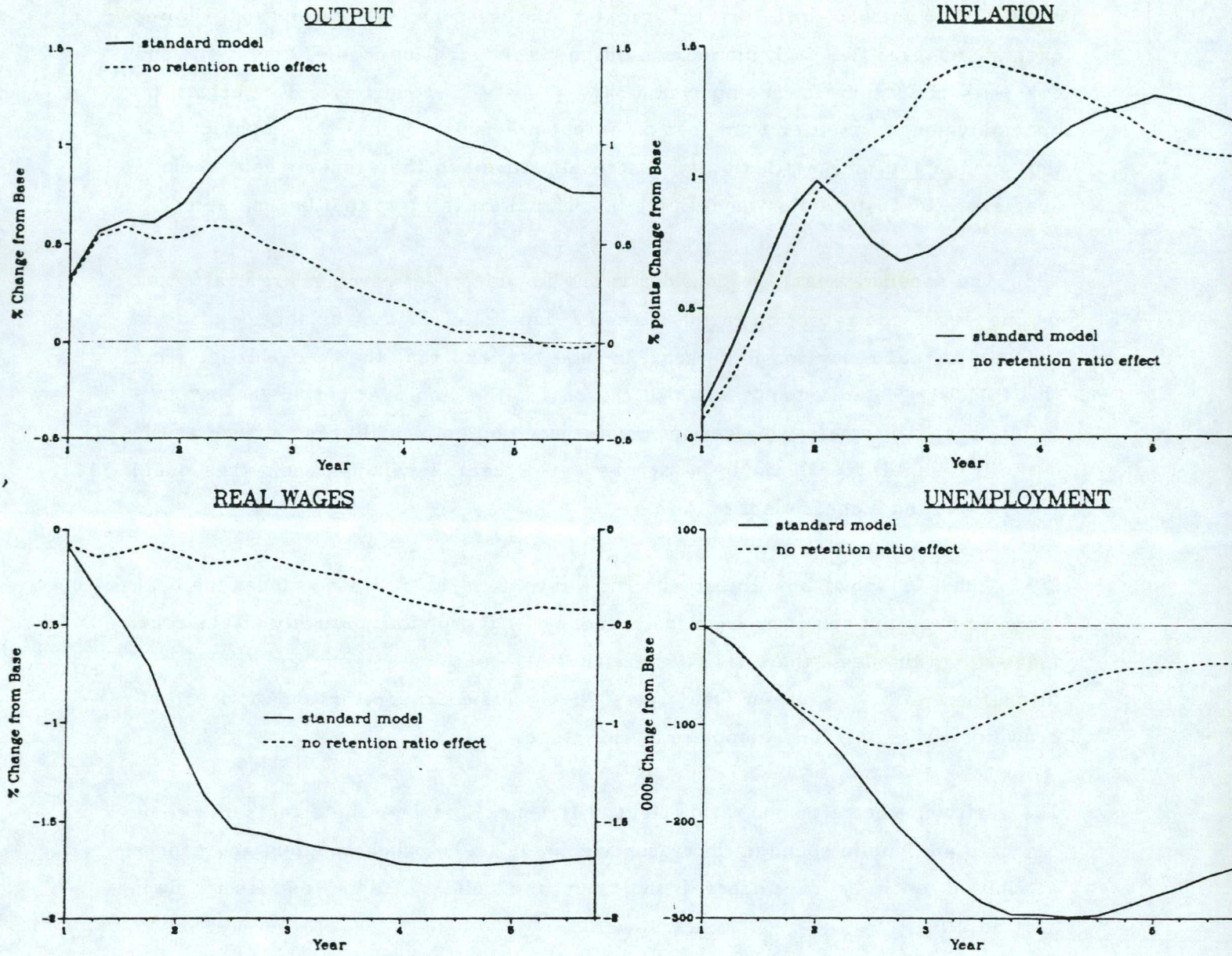

CHART 13

Trade Volumes

106. Sluggishness in the response of domestic costs to changes in nominal exchange rates can mean that even balanced changes in the growth of nominal demand (which, as we have seen, do not necessarily imply any long run changes in real variables) can lead to prolonged changes in international competitiveness. One factor affecting the output-inflation split over this period will therefore be the extent to which, when nominal demand accelerates and the exchange rate falls, domestic producers can take advantage of the temporary improvement in cost competitiveness to raise their output. This applies to firms competing in domestic markets, against imports, as well as those exporting to world markets.

1 per cent faster money GDP growth: trade elasticities doubled

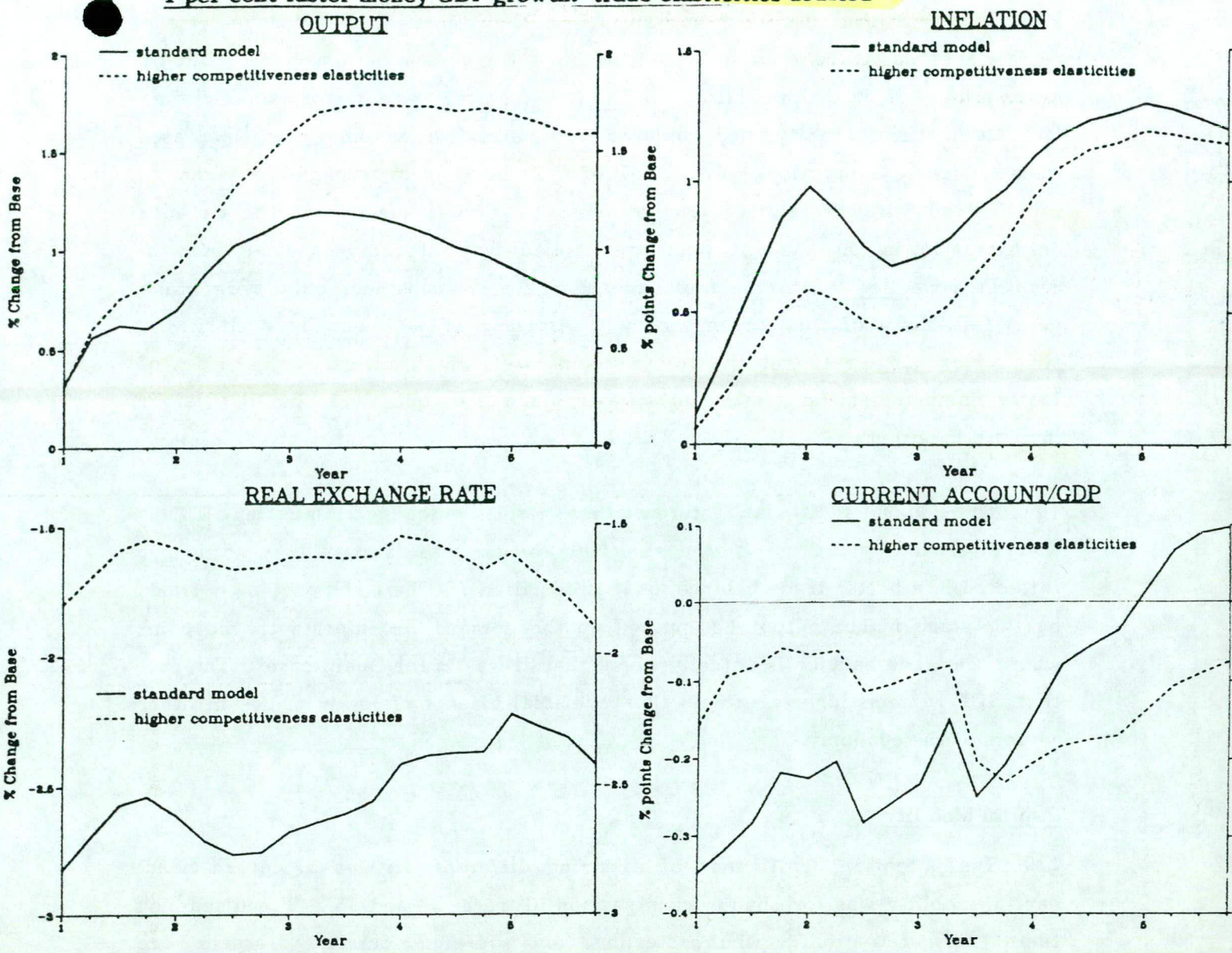

CHART 14

107. Chart 14 compares the effects of faster money GDP growth using the standard model, with those in which the responsiveness of traded volumes of goods and services to changes in competitiveness is doubled[32]. (This could be rationalised by an assumption that the upturn in demand comes at a time of unusually low capacity utilisation).

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32 In the Treasury model, cost or price competitiveness affects exports and imports of manufactures, exports and imports of services, and exports of non-manufactures. Although emipircal research has often failed to find well-determined competitiveness effects, we cannot be sure that doubling of coefficients is necessarily data-admissable, since in the Treasury model not all of the relevant coefficients are freely-estimated.

108. The additional increase in output which results from improved trade performance has to be accommodated, within the given path for money GDP, by lower prices. If, in the simulation, we had linked better trade performance with an increase in spare capacity, this would be one mechanism by which price increases were reduced. In practice, however, all of the effect works through the exchange rate instead. Higher relative price or cost elasticities mean that the ex ante deterioration in the current account, implied by faster money GDP growth, requires a smaller fall in the real exchange rate - because for each percentage point fall, more of the current account deterioration is reversed[33]. It is the stronger exchange rate (relative to our "main case") which mitigates the effect of faster nominal demand growth on inflation, and consequently leads to a larger increase in output.

109. There is one additional feature of these results which is worth noting. This is that after four years or so, the relatively bigger rise in output is no longer reflected in a better trade balance, as it is initially (see Chart 14); on the contrary, by this stage higher output has pushed up the demand for imports to the point where the trade balance is actually worse than it was in the "main case". The fact that GDP remains higher reflects the beneficial effects of lower prices in other sectors of the economy.

Capital Mobility

110. The potential significance of assuming different degrees of international capital mobility was foreshadowed in section III (paras 34 and 35). The discussion there indicated that, when sterling and foreign currency assets are less-than-perfect substitutes (whether because of different perceptions of risk, institutional constraints or whatever), international investors will require changes in relative rates of return in order to induce them to finance larger or smaller current account deficits. When UK real interest rates are fixed relative to the rest of the world, as they are in our balanced expansion case, changing differentials must take the form of an expected change in the rate of exchange rate depreciation.

111. One implication of this is that the importance of capital mobility will depend upon how great is the impact of a change in policy on the current account. The results in Table A of Section IV show that the current account effects of a

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33 Hence, also, the degree of expected real exchange appreciation which is needed to generate offsetting capital inflows is reduced. On both counts, the initial downward jump in the exchange rate will be smaller.

balanced increase in money GDP growth are fairly modest (¼ per cent of GDP or less in the short term, falling to around zero after four or five years). It is therefore no surprise that in these circumstances, as Chart 15 shows, quite a large reduction[34] in the degree of capital mobility has a comparatively small effect on the economy as a whole.

1 per cent faster money GDP growth: lower capital mobility

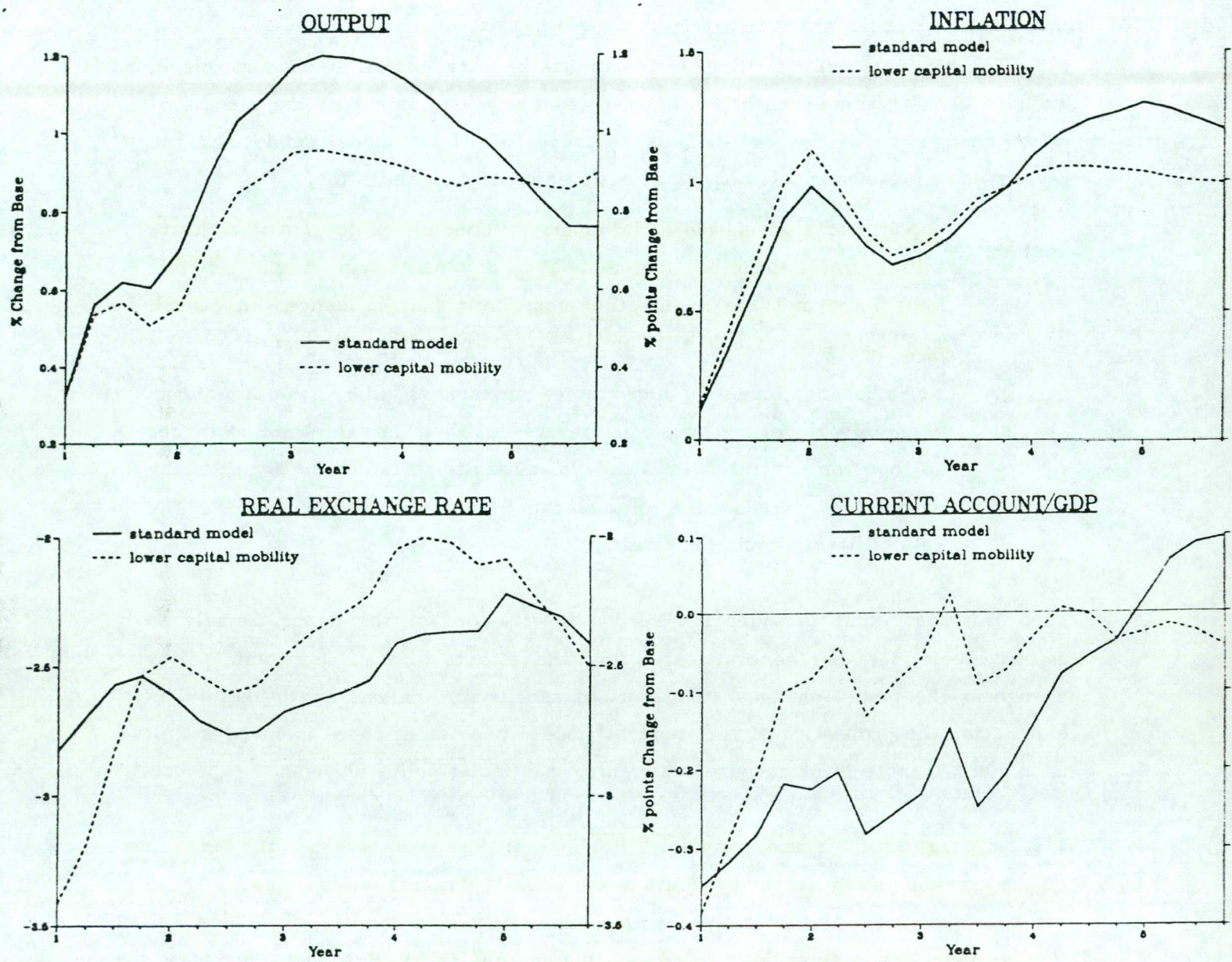

CHART 15

34 The (imposed) coefficient on the current balance in the exchange rate equation was increased ten-fold. It is difficult to know on what criterion a change to this coefficient could be described as "large", but we have found that a ten-fold increase significantly reduces the output effect of a change in policy mix (where current account effects are bigger).

112. The exchange rate initially falls by more, because agents anticipate that it will then appreciate more quickly, so generating the required increase in the relative return on sterling assets. This brings forward the inflation effect of faster demand growth, implying a correspondingly smaller increase in output. Chart 15 also demonstrates the fairly sensible result that the greater the cost of financing current account imbalances, the smaller those imbalances tend to be.

VII CONCLUSIONS

113. The motivation for writing this paper has been two-fold. In the first place, we have gone to some lengths to illustrate that any assessment of the effects of policy changes will vary according to the properties of the model employed. The reasons for emphasising this rather obvious point are to establish that:

i. expectations formation and the macroeconomic policy framework are as integral a part of "the model" as any other aspect of economic behaviour, and are among the most important influences on overall model properties and hence on the effects of policy changes;

ii. there is an element of uncertainty surrounding all relationships in an economic model and, while it may be desirable in some circumstances to focus on central estimates, it is equally important to be aware of the associated margins of error and the implications these have for the reliability of simulation results.

114. This last point provides the second motivation for the paper, namely to assess, albeit in rather general terms, how the effects of macroeconomic policy change as the model changes. This sort of sensitivity analysis can be helpful in elucidating the properties of the "central" model (insofar as there is one), as well as in giving a more informative assessment of particular policy changes.

115. In very broad terms, our analysis starts from the premise that in the long run macroeconomic policy mainly affects nominal rather than real variables. There are two reasons for this. Firstly, the structure of the Treasury model implies that the economy tends towards market clearing in the long run, though clearly the process of adjustment can be long and drawn out. Secondly, aggregate supply in the long run is largely independent of changes in the level or rate of growth of aggregate demand. It is recognised that in practice there may be factors which violate this independence (for example, to the extent that the capital stock and

real balances may be affected by changes in macroeconomic policy). But we argue that, in the Treasury model at least, these factors are either absent or quantitatively unimportant.

116. From this we conclude that the short run effects of macroeconomic policy on output, employment and other real variables derive mainly from the tendency for prices to adjust only with a lag, and for different markets in the economy to adjust at different speeds - wages tending to lag behind goods prices, and domestic goods prices lagging behind changes in the exchange rate. It is the consequent changes in relative prices (especially the real wage, the real exchange rate and the real interest rate) which generate effects on the level of output and employment.

117. One change in output which is not attributable to adjustment lags comes about because of the response of real wages to a change in personal income tax (the retention ratio effect). But here it is useful to distinguish between the macroeconomic policy change, ie the change in fiscal stance, for which the preceding analysis applies, and the microeconomic policy change, which comes about because lower income tax reduces the wedge between the real product wage and the real consumption wage. It is this microeconomic effect which accounts for much of the difference, particularly beyond the first couple of years, between the results of changing the fiscal-monetary mix using lower income tax as opposed to higher public expenditure. Similar considerations would apply in the case of changes in other sorts of tax; for example VAT or NICs.

118. Given the significance of the adjustment process, it is not surprising that expectations formation is also of crucial importance - since the principal effect of different expectations regimes is to speed up or slow down the response of prices (including exchange rates and interest rates) to changes in policy, both current and future. The more forward-looking (and accurate) expectations are, the smaller are the effects of changes in macroeconomic policy on output and employment - essentially because relative prices adjust more quickly to offset the direct effects of the initial change in policy.

119. In circumstances where there are no direct effects on the supply side, we have shown how macroeconomic policy can raise output in the short term in one of two ways. The first involves a loosening of the stance of fiscal policy, offsetting any effects on money GDP by raising interest rates. As a strategy, this has a number of drawbacks:

- it is unsustainable, and will typically imply, at some point in the future, higher unemployment, higher inflation or both;
- it relies for its effectiveness on a higher exchange rate (thereby temporarily reducing inflation and raising real national income); as such, it may fail, either if higher deficits cause the financial markets to lose confidence in the authorities' medium term commitment against inflation, or if other countries refuse to accept a deterioration in their terms of trade and so alter the mix of their policies in line with the UK;
- it will generally involve a reduction in national wealth, including a rise in net indebtedness to the rest if the world.

120. The second possible strategy is to use a given mix of fiscal and monetary policy to raise the growth rate of nominal GDP permanently. This works mainly by depressing real wages (because wages tend to lag behind prices) and will be less effective the quicker wage bargainers catch on to the revised stance of policy. As in the case of a change in policy mix, the long run effects on output are likely to be very small, and could well be adverse. The strategy's main legacy is a permanently higher rate of inflation.

121. The recognition that the effects of macroeconomic policy derive largely from market imperfections provides a perspective for the section of the paper which deals with model variants. Apart from the retention ratio effect - which, as we have said, is a special case - the variants each serve to highlight a particular aspect of this approach. We show that:

- the quicker the response of the labour market (ie wage rates) to changes in excess demand, the smaller the real effects of changes in policy stance;
- the greater the responsiveness of the economy to changes in relative prices (eg trade volumes responding to changes in the real exchange rate), the larger the effect of macroeconomic policy on output;
- and that, in a world of imperfect markets, "second-best" situations can arise; thus, when an increase in demand causes a deterioration in the current account (because of rigidities in domestic supply), a lower degree of substitutability between sterling and foreign currency assets may actually reduce the real effects of that demand increase (intuitively, because the additional cost of financing the deficit forces more adjustment in domestic markets).

122. Needless to say, the variants reported in this paper form only a small sample out of a potentially very large population. In practice, the circumstances in which a policy change is made, as well as the nature of the change itself, will suggest which variants are most appropriate. And, in some cases, this may affect not only the margins of error attached to a particular central estimate, but also the central estimate itself (as the Lucas critique implies).

123. If we were to single out any one theme, or message, from this paper, it would be that the use of macroeconomic models for policy analysis is unlikely ever to be a purely mechanical process. Moreover, the areas where judgement is most needed - particularly in the specification of the policy environment and the treatment of expectations - have been shown to be amongst the most important in determining the results of model-based policy analysis. This suggests that future research could usefully be directed towards giving these judgements a sound theoretical and empirical basis, making them at the same time more sophisticated and less arbitrary.

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ANNEX I

TABLE 1

CHANGES IN POLICY MIX

Increase of one percentage point in PSBR/GDP ratio for 5 years: non-accommodating monetary policy

FISCAL INSTRUMENT	Personal Income Tax			General Government Investment		
INTEREST RATE POLICY	Optimal money GDP control	Fixed MO	Feedback rule	Optimal money GDP control	Fixed MO	Feedback rule
% change from base in:						
REAL GDP						
Year 1	+.1	0	0	+.5	+1.2	+.8
Year 2	+.6	+.4	+.4	+.5	+1.0	+.4
Year 3	+1.1	+.8	+1.1	+.3	+.8	+.3
Year 4	+1.1	+1.0	+1.2	-.2	+.2	-.2
Year 5	+.7	+.9	+.8	-1.0	-.5	-.8
MONEY GDP						
Year 1	+.1	0	0	+.2	+.9	+.4
Year 2	0	-.2	-.1	0	+1.3	0
Year 3	0	-.3	0	0	+2.2	+.2
Year 4	0	+.2	+.2	0	+2.6	+.2
Year 5	0	+1.0	+.3	0	+2.9	+.3
RPI INFLATION						
Year 1	+.1	+.1	+.1	+.1	+.1	0
Year 2	-.7	-.7	-.7	-.3	+.8	0
Year 3	-.4	-.1	-.3	+.3	+1.2	+.3
Year 4	+.5	+.7	+.5	+1.0	+1.3	+.8
Year 5	+.9	+1.2	+.9	+1.2	+.8	+1.0
REAL EARNINGS						
Year 1	0	+.1	+.1	+.6	+.3	+.6
Year 2	-.4	-.4	-.4	+.9	+.4	+.8
Year 3	-.7	-.7	-.7	+.4	0	+.3
Year 4	-.8	-.9	-.8	+.2	-.4	+.1
Year 5	-1.0	-1.3	-1.1	-.2	-.6	-.2
REAL EXCHANGE RATE						
Year 1	+1.4	+1.7	+1.6	+2.7	0	+2.7
Year 2	+.2	0	0	+1.4	-.2	+1.1
Year 3	-.1	-.8	-.2	+.9	+.1	+1.0
Year 4	0	-1.2	-.2	+.7	+.5	+.8
Year 5	-.3	-1.2	-.1	+.1	+.8	+.6
S-T INTEREST RATES						
Year 1	+.9	+1.2	+1.2	+1.5	+.7	+1.5
Year 2	+.1	+.2	-.1	+1.0	+1.4	+.8
Year 3	+.5	+1.0	+.6	+1.4	+1.7	+1.5
Year 4	+1.6	+1.6	+1.4	+2.3	+2.1	+2.0
Year 5	+2.2	+2.0	+2.2	+2.5	+1.9	+2.5

TABLE 1 (Cont)

CHANGES IN POLICY MIX

Increase of one percentage point in PSBR/GDP ratio for 5 years: non-accommodating monetary policy

FISCAL INSTRUMENT	Personal Income Tax			General Government Investment		
INTEREST RATE POLICY	Optimal money GDP control	Fixed MO	Feedback rule	Optimal money GDP control	Fixed MO	Feedback rule
% change from base in:						
CURRENT ACCOUNT (£bn)						
Year 1	-.3	-.2	-.3	-1.0	-2.5	-1.8
Year 2	-2.1	-1.8	-1.8	-3.0	-3.1	-2.6
Year 3	-4.1	-3.4	-3.9	-3.9	-3.7	-3.8
Year 4	-4.4	-3.6	-4.3	-2.9	-2.8	-2.8
Year 5	-3.6	-3.4	-3.9	-.4	-1.0	-1.1

TABLE 2

DIFFERENT EXPECTATIONS ASSUMPTIONS

Increase of one percentage point in PSBR/GDP ratio for 5 years, via lower income tax: money GDP unchanged

	Consistent expectations: Fiscal shock reversed after 5 years	Consistent expectations: fiscal shock accommodated after 5 years	Backward-looking expectations
% change from base in:			
REAL GDP			
Year 1	+.1	+.1	+.1
Year 2	+.6	+.4	+.6
Year 3	+1.1	+.9	+1.1
Year 4	+1.1	+.7	+1.2
Year 5	+.7	-.5	+1.1
RPI INFLATION			
Year 1	+.1	+.1	+.2
Year 2	-.7	-.5	-.6
Year 3	-.4	-.2	-.4
Year 4	+.5	+1.1	+.2
Year 5	+.9	+2.6	+.1
REAL EARNINGS			
Year 1	0	0	-.1
Year 2	-.4	-.5	-.4
Year 3	-.7	-.8	-.6
Year 4	-.8	-1.1	-.5
Year 5	-1.0	-1.7	-.5
REAL EXCHANGE RATE			
Year 1	+1.4	+1.3	+1.2
Year 2	+.2	+.2	0
Year 3	-.1	-.5	-.1
Year 4	0	-1.2	+.6
Year 5	-.3	-3.4	+.9
S-T INTERST RATES			
Year 1	+.9	+.9	+1.0
Year 2	+.1	+.3	+.2
Year 3	+.5	+.9	+.6
Year 4	+1.6	+2.7	+1.2
Year 5	+2.2	+5.1	+1.1
CURRENT ACCOUNT (£bn)			
Year 1	-.3	-.2	-.4
Year 2	-2.1	-1.7	-2.2
Year 3	-4.1	-3.4	-4.0
Year 4	-4.4	-2.9	-4.4
Year 5	-3.6	+.5	-5.2

TABLE 2 (cont)

DIFFERENT EXPECTATIONS ASSUMPTIONS
"Balanced" one percentage point reduction in money GDP growth

	Consistent expectations	Backward-looking expectations	"Learning" (see para 82)
% change from base in:			
REAL GDP			
Year 1	-.5	-.6	-.7
Year 2	-.9	-1.7	-1.5
Year 3	-1.2	-2.9	-2.0
Year 4	-1.1	-3.4	-1.7
Year 5	-.8	-3.0	-1.1
RPI INFLATION			
Year 1	-.5	-.1	-.2
Year 2	-.8	+.1	-.6
Year 3	-.8	+.1	-.7
Year 4	-1.2	-.8	-1.4
Year 5	-1.3	-1.4	-1.8
REAL EARNINGS			
Year 1	+.4	+.1	+.2
Year 2	+1.4	+1.1	+1.6
Year 3	+1.7	+1.9	+2.2
Year 4	+1.9	+2.1	+2.2
Year 5	+1.9	+1.9	+2.1
REAL EXCHANGE RATE			
Year 1	+2.8	+.3	+1.6
Year 2	+2.9	+1.5	+3.5
Year 3	+2.9	+2.6	+3.8
Year 4	+2.7	+2.2	+3.3
Year 5	+2.7	+.8	+3.0
S-T INTEREST RATES			
Year 1	-.4	0	-.1
Year 2	-.7	+.1	-.4
Year 3	-.7	+.2	-.6
Year 4	-1.0	-.5	-1.1
Year 5	-1.1	-1.1	-1.6
CURRENT ACCOUNT (£bn)			
Year 1	+1.2	+1.6	+1.8
Year 2	+1.2	+4.8	+2.9
Year 3	+1.2	+8.3	+2.8
Year 4	+.5	+9.2	+1.4
Year 5	-.3	+8.4	-.6

TABLE 3

CHANGES TO KEY MODEL RELATIONSHIPS

"Balanced" one percentage point increase in money GDP growth

	Standard model	Steeper short-run Phillips curve	No retention ratio effect	Higher competitiveness elasticities	Lower capital mobility
% change from base in:					
REAL GDP					
Year 1	+.5	+.5	+.5	+.6	+.5
Year 2	+.9	+.8	+.6	+1.2	+.8
Year 3	+1.2	+.9	+.3	+1.7	+.9
Year 4	+1.1	+.6	+.1	+1.7	+.9
Year 5	+.8	+.4	0	+1.6	+.9
RPI INFLATION					
Year 1	+.5	+.5	+.4	+.3	+.6
Year 2	+.8	+.8	+1.1	+.5	+.9
Year 3	+.8	+1.0	+1.4	+.6	+.9
Year 4	+1.2	+1.4	+1.3	+1.1	+1.1
Year 5	+1.3	+1.3	+1.1	+1.2	+1.0
REAL EARNINGS					
Year 1	-.4	-.3	-.1	-.2	-.5
Year 2	-1.4	-1.0	-.1	-.8	-1.4
Year 3	-1.7	-1.0	-.2	-1.0	-1.5
Year 4	-1.9	-1.1	-.4	-1.1	-1.7
Year 5	-1.9	-1.1	-.4	-1.2	-1.7
REAL EXCHANGE RATE					
Year 1	-2.8	-2.3	-1.6	-1.7	-3.0
Year 2	-2.9	-2.2	-1.2	-1.6	-2.5
Year 3	-2.9	-1.9	-1.0	-1.6	-2.3
Year 4	-2.7	-1.7	-1.1	-1.6	-2.1
Year 5	-2.7	-1.8	-1.3	-1.8	-2.3
S-T INTEREST RATES					
Year 1	+.4	+.4	+.3	+.2	+.5
Year 2	+.7	+.7	+.9	+.4	+.7
Year 3	+.7	+.9	+1.2	+.5	+.8
Year 4	+1.0	+1.2	+1.2	+.9	+1.0
Year 5	+1.1	+1.2	+1.1	+1.0	+1.0
CURRENT ACCOUNT (£bn)					
Year 1	-1.2	-1.2	-1.2	-.4	-1.0
Year 2	-1.2	-1.3	-1.3	-.4	-.5
Year 3	-1.2	-1.2	-.8	-.9	-.4
Year 4	-.5	-.4	-.2	-1.1	-.2
Year 5	+.3	+.5	+.5	-.6	-.2

ANNEX 1

A MONETARY TARGET ACCOMMODATING A PERMANENT CHANGE IN NOMINAL INCOME

1. Suppose real GDP) is a function of real interest rates and some exogenous demand variable X;

$$y = - \alpha (r - \dot{p}) + x \qquad (1)$$

2. Suppose also that the money supply is fixed at $\bar{m}$, with demand for real balances depending on nominal interest rates and real income:

$$\bar{m} - p = - \beta r + \gamma y \qquad (2)$$

(all variables except r in logs)

3. Assume, finally that inflation is determined by a simple Phillips curve relationship:

$$\dot{p} = \phi (y - y_n) \qquad (3)$$

4. Adopting the usual normalisation (the natural rate of output $y_n = 0$) and substituting (3) and (2) into (1) gives:

$$y = \frac{1}{\beta - \alpha\beta\phi + \alpha\gamma} \left[\alpha(\bar{m} - p) + \beta X\right] \qquad (4)$$

5. In the steady state, $y = y_n = 0$, so we can solve (4) for the long run relationship between X and p:

$$p = \bar{m} + \frac{\beta}{\alpha} X \qquad (5)$$

6. This shows that, providing money demand is interest elastic (β is positive) and the interest elasticity of output is finite, a rise in X (in our case, due to fiscal expansion) will raise p permanently. Since money GDP is equal to y + p, this represents a permanent increase in money GDP.

7. Of course the result depends on being able to sustain a rise in X, with an offsetting increase in real (and hence nominal) interest rates. Only if r is permanently higher will velocity rise in the long run. Whether a sustained increase in real interest rates <u>is</u> possible depends on its more fundamental determinants, which are missing from this simple model, and indeed from the

Treasury model itself. We argue in the paper that the scope for changing real interest rates in the long term, relative to rates overseas, is extremely limited. The counterpart to this is that fiscal policy will not be able to generate a sustained change in X (recall that X is in real terms). Hence, as a long term proposition, the partially accommodating nature of a fixed monetary target is likely to be of little practical significance.

ANNEX III

ASSUMPTIONS ON CASH LIMITS, LOCAL AUTHORITY FINANCE AND EXPENDITURE, AND THE NATIONAL INSURANCE FUND

Cash Limits

1. In the first year of all simulations, the sum of central government expenditure on wages and salaries, procurement and investment is fixed in cash terms. If prices or earnings change in the simulation, the volume of procurement and investment is altered so as to maintain the aggregate cash plans; central government employment is not assumed to bear any of the adjustment.

2. After the first year, different assumptions are made depending on whether or not the simulation in question involves a change in the overall stance of policy. If it does not, the system described in the previous paragraph is maintained, except that only half of any divergence in prices is offset on volumes. If, however, the stance of policy accommodates permanently higher or lower inflation, nominal expenditure changes in line with prices beyond year 1.

Local authority finance

3. In all simulations, LA rates are assumed to be fixed in the first year, with market borrowing the residual source of finance. From the second year onwards, market borrowing is constrained to move in line with LAs' capital expenditure. Rates are then the residual source of finance. The aggregate exchequer grant to LAs is treated like all other cash-limited central government expenditure.

Local authority procurement

4. LA procurement is assumed to behave as if it were cash limited, except that, in addition, we assume that 20 per cent of any real change in the aggregate exchequer grant is matched by an equal and opposite change in the volume of procurement expenditure (the remaining 80 per cent being financed out of the rates).

National Insurance Fund

5. Any ex ante change in net inflows to the NIF is assumed to be offset by an across-the-board change in the rates of national insurance contribution (employers' and employees') from year 2 onwards. The changes in rates implied by the simulations in this paper are small - generally around one tenth of a percentage of point.

53/2/LPD/3744/036

FROM: P D P BARNES
DATE: 9 December 1987

PS/CHANCELLOR

cc Sir P Middleton
Sir T Burns
Mr Byatt
Mr Cassell
Mr Scholar
Mr Olding-Smee
MEG
Mr R I G Allen
Mr S Davies
Mr Grice
Mr Mellis
Mr Riley
Mr Bradenkamp
Mr Cropper
Mr Call

WORKING PAPER ON MACROECONOMIC POLICY SIMULATIONS

The Economic Secretary has seen Mr Odling-Smee's submission to the Chancellor of 8 December.

2. The Economic Secretary thinks the core of Mr Bradenkamp's paper is excellent and valuable. However, he thinks that neither the author's introduction, nor Mr Odling-Smee's covering note, recognises either the most interesting conclusion or the most important qualifications.

3. The Economic Secretary thinks that the interesting conclusion is that, for a given path of nominal GDP, tax cuts produce more growth and more jobs than increased public spending, even on investment.

4. The Economic Secretary thinks that the most important qualifications on the use of the models are not "the uncertainty surrounding key relationships" but the omission of key phenomena. For example, the models do not allow for the occurrence of financial crises. Yet we know that these can occur, particularly when governments pursue the policies of demand stimulation modelled

in Mr Bredenkamp's section 4. Nor does the model incorprorate the fact that over a prolongued period in the 1960s and 1970s "expansionary" policies led to rising unemployment and stagnant output.

5. The Economic Secretary would not press for the paper to be amended to incorporate these points. The basic conclusion that the Economic Secretary draws from the paper is that it endorses tax cuts. He thinks it would be useful in countering Parliamentary jibes about public spending being more effective than tax cuts in creating jobs.

P D P BARNES
Private Secretary

RA3.88

UNCLASSIFIED

pup

FROM: A C S ALLAN
DATE: 14 December 1987

MR ODLING-SMEE

cc PS/Economic Secretary
Sir P Middleton
Sir T Burns
Mr Byatt
Mr Cassell
Mr Scholar
MEG
Mr R I G Allen
Mr ~~Hibbert~~
Mr Grice
Mr Mellis
Mr Riley
Mr Bredenkamp
Mr Cropper
Mr Call

WORKING PAPER ON MACROECONOMIC POLICY SIMULATIONS

The Chancellor was grateful for your minute of 8 December, and has seen the Economic Secretary's comments recorded in Mr Barnes minute of 9 December.

2. He is content for this working paper to be published in a low profile way. He would wish to see two amendments:

(i) In paragraph 11, the description of funding policy needs to be updated to take account of the developments announced in the Mansion House Speech.

(ii) The third sentence of paragraph 17 should be deleted. ("Although in early versions of the MTFS objectives were expressed in terms of monetary aggregates, rather than money GDP itself, and the emphasis on different aggregates and other indicators has changed over time, the fundamental principle has been essentially the same since 1979.")

A C S ALLAN

From: **J ODLING-SMEE**

22nd December 1987

ECONOMIC SECRETARY

cc Chancellor 12/2
Sir Peter Middleton
Sir Terence Burns
Mr Byatt
Mr Cassell
Mr Scholar
MEG
Mr R I G Allen
Mr S Davies
Mr Grice
Mr Melliss
Mr Riley
Mr Bredenkamp
Mr Cropper
Mr Call

WORKING PAPER ON MACRO-ECONOMIC POLICY SIMULATIONS

Perhaps I could respond to your comments on the omission of key phenomena from models, and the comparison of tax cuts and spending increases in the Treasury model.

2. It is certainly true that economic models are not able to explain all real world phenomena. When it comes to estimating the effects of unsound or unpredictable macro-economic policies, either on financial markets or on the economy's long-term growth performance, models will typically tell only part of the story.

3. The Treasury model can be used to shed some light on these particular issues. For example, it allows for situations in which interest rates and exchange rates move sharply in response to changes in inflation expectations - but not for irrational "speculative bubbles". Similarly, the model would have predicted that rising public expenditure and taxation during the 1960s and 1970s would raise unemployment, even though some of the mechanisms involved are not accounted for.

4. In countering Opposition claims about spending increases versus tax cuts, we should not suggest that the latter produce more jobs from the very beginning. The simulations show them taking the lead in the second year. More generally the omission of some relevant supply side mechanisms from the model, such as the effects of tax cuts on incentives and enterprise, means that policy conclusions based on simulations have to be cautious and qualified.

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J ODLING-SMEE

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53/2/LPD/3746/032

FROM: G R WESTHEAD
DATE: 23 December 1987

MR ODLING-SMEE

cc PS/Chancellor
PS/Sir P Middleton
Sir T Burns

WORKING PAPER ON MACRO-ECONOMIC POLICY SIMULATIONS

The Economic Secretary has seen and was grateful for your minute of 22 December.

Guy Westhead.

GUY WESTHEAD
Assistant Private Secretary