On some slippery slopes: horizontalists, structuralists and diagrams

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Abstract

Since Basil Moore published *Horizontalists and Verticalists* in 1988, there have been numerous attempts to model an endogenous money supply within a graphical framework which would also facilitate discussion of some of the controversial issues surrounding it. These have not generally been very successful until Fontana's recent (2003, 2006) adoption of a pure flow of funds framework.

More recently, the 'New Keynesian consensus' in macroeconomics has finally forced a rejection of the exogenous money paradigm and the *LM* part of the familiar *IS/LM/AS* model. In this paper we show how, with some modification, Fontana's approach can be combined with 'mainstream' replacements of *IS/LM* (Carlin and Soskice, 2006; Bofinger, Mayer and Wollmerhäuser, 2006) to produce a model of the monetary sector which illustrates both the current wisdom about monetary policy (e.g. Woodford, 2003) and the post-Keynesian insights that have been developed over the last twenty years.

1. Introduction

Economists of a post Keynesian persuasion and with an interest in money could be forgiven a wry smile over recent developments. With Woodford's (2003) *Interest and Prices* we have what the author calls the 'foundations of a theory of monetary policy' in which the money supply is endogenously determined and the short-run interest rate is the policy instrument. And Woodford is not alone. Just a few years earlier publications by Clarida *et al.* (1999), Romer (2000) and Walsh (2002) suggested that, at long last, economists of an 'orthodox' persuasion were catching up with what both central bank and post Keynesian economists had known for years.[1]

But while a wry smile may be justified, premature self-congratulation is not. There is a distinct danger here that textbooks of the future will eventually be written that give the credit for this 'breakthrough' in monetary economics entirely to the writers named above. It would be galling, for most post-Keynesian economists, if, after having been right all along,[2] they found their work ignored by future generations of students who were brought up to believe that the truth was discovered only around the cusp of the millennium by something called the 'new consensus macroeconomics'. This would be especially true for those who emphatically reject the long-run neutrality of money which is part of the 'new consensus'. [3] Fortunately there is still hope since macroeconomic textbooks which treat money in an accurate and helpful way are only just beginning to appear.[4]

This paper is largely about the representation of the essentials of endogenous money and how those essentials can be linked to a tractable pedagogic model of the macroeconomy. In doing so it draws largely on the existing work of others (post Keynesian and 'new consensus'). But it is, critical of some aspects of each of these contributions and, of course, is treading new ground by bringing them together.

We start, in the next section, by looking backward – at some of the difficulties and errors perpetrated in early attempts to link the endogeneity of money to conventional expositions of macroeconomics and at how these expositions came to be associated with positions in the structuralist/accommodationist debate which was then in progress.

In section 3 we examine the framework developed by Fontana (2003 and 2006) to represent the essentials of an endogenously-determined money supply. We shall show that amongst its various strengths it can even capture some of the quite subtle debates (the demand for endogenous money, structuralist/accommodationist) that have taken place amongst post-Keynesian economists.

In section 4 we turn our attention to a recent attempt to construct an alternative to *IS/LM/AS,* in which the money supply is endogenously-determined and the policy instrument is the rate of interest. For reasons we explain during the discussion, we have chosen the approach of Carlin and Soskice.

In section 5, we show that some of the weaknesses of this (and related) approaches can be remedied by borrowing from Woodforde (2003) and Fontana (2006) and, above all, that combining a modified version of Fontana (2006) with Carlin-Soskice (C-S) can create a model

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[1] 'Virtually every monetary economist believes that the CB can control the monetary base and ... the broader monetary aggregates as well. Almost all of those who have worked in a CB believe that this view is totally mistaken' (Goodhart, 1994 p.1424). And in Woodford's words: 'It is true that the conceptual frameworks proposed by central banks to deal with their perceived need for a more systematic approach to policy were, until quite recently, largely developed without much guidance from the academic literature on monetary economics' (Woodford, 2003 p.3).

[2] Or at least for the thirty years since Davidson and Weintraub (1973).

[3] For example, Arestis and Sawyer (2002, 2005); Sawyer (2002); Fontana and Palacio-Vera (2005); Romer and Romer (1989); Leon-Ledesma and Thirlwall (2002); McCombie *et al* (2002) and many others.

[4] Carlin and Soskice (2006) make a bold effort and almost succeed. On the other hand, within the last year alone I have received unsolicited copies of five new macroeconomic textbooks. In four of the five (Burda and Wyplosz, 2005; DeLong and Olney, 2006; Krugman and Wells, 2006; Miles and Scott, 2005), the *AD* curve is derived from an *IS/LM* model wherein the authorities are assumed to fix the money supply.

which can be used to combine the principles of the (reformed) mainstream macroeconomics with the subtleties and richness of the post-Keynesian insights on money. Section 6 concludes.

2. Early representations of endogenous money

In reacting against models of the macroeconomy in which the money supply is treated as exogenous, it is understandable that critics should want to find a representation of endogenous money which confronted the orthodoxy as directly as possible. Since the orthodoxy depicted the money supply as a vertical curve drawn in interest-money space, the temptation to turn it through ninety degrees and claim that the money supply was completely elastic at the rate of interest of the central bank's choosing (now represented by the intercept), was irresistible. Indeed, it lay behind the title of Basil Moore's treatise published in 1988.[5] Unfortunately, however intuitively appealing, it was misleading. That framework was intended to show the behaviour of stock demand and supply, while the endogeneity of money was concerned with *flows*. Be that as it may, the idea that turning the (stock) money supply curve through ninety degrees could yield a useful comparison with the orthodox view caught on.[6]

The errors encouraged by this were set out by Arestis and Howells (1996) and therefore need only brief mention here. The first is a logical one and goes to the very heart of the endogenetiy paradigm. The money supply is endogenous because the deposits that make up (the bulk of) the money supply are created by net new bank loans, the demand for which originates *within the economic system*. However, given that the deficit units demanding credit are somewhat distinguished from those (the 'general population') who must hold the resulting deposits, there must be some process whereby any *ex ante* divergence in these preferences is reconciled. In other words, what emerges *ex post* as endogenous money is the resultant of the demand for loans *and* the demand for money. It is not a supply curve in the conventional sense of the term. And, moreover, since it already incorporates a 'demand for money' there seems little point in drawing it in a framework whose very purpose is to show the interaction between *independent* demand and supply curves. A more realistic use of interest-money space would be to recognise that the real contrast between the endogenous/exogenous cases is that in the latter the supply curve shifts *if and only if* the central bank makes a conscious decision to shift it, while in the former a continual rightward shift is the norm. Furthermore, *if* the rate of rightward shift of the supply curve matches that of the demand curve, then the movements will trace out a locus which will be horizontal with the respect to the rate of interest – in effect a horizontal *LM* curve. But it need not be horizontal and it is not a supply curve.

There is a further problem and this grows out of what at first sight looks like an advantage of our new interpretation. The apparent advantage of representing the endogeneity of money as a *constantly shifting* supply curve which, when allied to a shifting demand curve, traces out an *LM* curve which could be horizontal allows us to introduce the notion of liquidity preference. As we noted above, if the demand for new loans creates additional deposits at a rate which is exactly matched by the willingness of the community to hold additional wealth in that form, then the interest rate locus will be horizontal. But suppose, by contrast, we have a reduction in liquidity preference such that the *ex ante* demand for loans now creates deposits at a rate which exceeds the community's willingness to hold additional wealth in money form. Then a change in relative interest rates occurs, the effect of which is to produce the necessary *ex post* equilibrium by

[5] Moore (1988) *Horizontalists and Verticalists: The macroeconomics of credit money* (Cambridge: Cambridge U P)

[6] This is a major, but charitable, simplification. Those who describe the behaviour of endogenous money in interest-money space by reference to a *money supply* curve include Lavoie, 1985, p.71; Kaldor, 1982, p.24, 1983 p.22; Moore, 1988, p.263 and 1989, p.66; Rousseas, 1986, p.85 Wray, 1990, pp.166-7. Others, e.g. Palley, 1991, p.398; Dow 1993, 1994 and Dow and Earl, 1982, p.140 refer to it as a *credit* or *loan supply* curve. Lavoie, on a later occasion (1994, p.12) covers all possibilities by referring to it as a '...credit *or* money supply curve...' (our emphasis). What all this shows is that the initial decision to tell the story of endogenous money supply creation within an orthodox framework led to a good deal of confusion.

simultaneously slowing the expansion of bank loans and increasing the demand for the resulting deposits. The details of these relative changes are in Howells (1995). Briefly, the attempt to limit their holdings of the newly created deposits involves agents switching to non-money assets whose prices rise and yields fall. Since these non-money assets are simultaneously the liabilities of deficit units, the switch has reduced the cost of non-bank borrowing leading to a reduced flow of new loans (and deposits). At this point the locus of intersections in our supply and demand diagram shifts downward, resuming a horizontal trajectory as soon as the rate of deposit creation (rate of shift of the supply curve) is reduced to match the rate of increase in the willingness to hold new money.

So why is this advantage only apparent rather than real? The answer lies in the rate of interest whose path is being traced out in the locus. The rate of interest in the interest-money space of the orthodox money market diagram, *must* represent the opportunity cost of money.[7] It cannot be anything else, if the interest-money space is to host a downward-sloping money demand curve.[8] So far so good - the rate on non-money assets that we want to trace out could be said, with only a little simplification, to represent the opportunity cost of holding money.[9] But at the beginning of this section, we saw that endogenous money was often represented in interest-money space, not just by a ninety-degree rotation of what was called a supply curve but also that the intercept on the vertical axis was treated as the *interest rate set by the central bank*.

> The short-term supply function of nominal credit money is horizontal in interest-money space, at a level based on the supply price of liquidity (reserves) administered by the central bank. Whenever the central bank increases or reduces its marginal lending rate to the financial system in pursuing its ultimate policy goals, the horizontal money supply function shifts vertically up or down. (Moore, 1988, p.263)

Here is the problem. We cannot get away from the fact that interest-money space requires that the interest rate must be the opportunity cost of holding money. As we saw above, this might be consistent with it also being the rate on non-money assets which reconciles the demand for loans with the willingness to hold deposits but it cannot be the policy rate set by the central bank. And we cannot salvage the situation by saying that a *change* in the rate on the vertical axis represents a matching *change* in the policy rate by virtue of a stable mark up. The mark up literature relates to the rate charged on bank loans which again is far removed (as a concept) from any rate on non-money assets. Furthermore, empirical work on the relationship between the official rate and market rates (on loans, deposits, bonds and whatever else, and in a range of countries) suggests that there are large and persistent variations in spreads in response to a change in the policy rate. (Biefang-Frisancho Mariscal and Howells, 2002; Cook and Hahn, 1989; Cuthbertson *et al*, 2000; Dale, 1993; Heffernan, 1997).

The argument of this section is that early attempts to discuss endogenous money within an interest-money framework inherited from orthodox economics were quite unsatisfactory, though one can understand the desire to confront the exogenous money fiction in the simplest and most direct way. We shall see in the next section that a discussion which yields genuine insights needs a completely different framework. Before leaving interest-money space, however, we should

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[7] This is an admittedly Tobinesque interpretation of the demand for money. But it makes no difference to our argument if we take a more fundamentally Keynesian position and think in terms of the downward-sloping money demand curve being the outcome of expectations about the future level of interest rates derived from a view about the current level in relation to some 'normal' level. The relevant rate is still the rate on non-money assets, i.e. on 'bonds'.

[8] Suppose we think of it as money's own rate, for example. The demand curve would then have to be upward-sloping.

[9] After all, most undergraduate textbooks take 'bonds' to be the alternative to money and bonds are certainly one form of non-money asset whose issue represents an alternative to bank borrowing as a source of corporate finance. A simplification is involved, however, since the opportunity cost of holding money should strictly be a spread term – the difference between the bond rate and money's own rate. The common practice of representing it by the bond rate requires an assumption that money pays no interest, of course.

refer at least briefly to one of the major debates within the endogenous money paradigm which drew on the confusion (and to which we refer in the title of this paper).

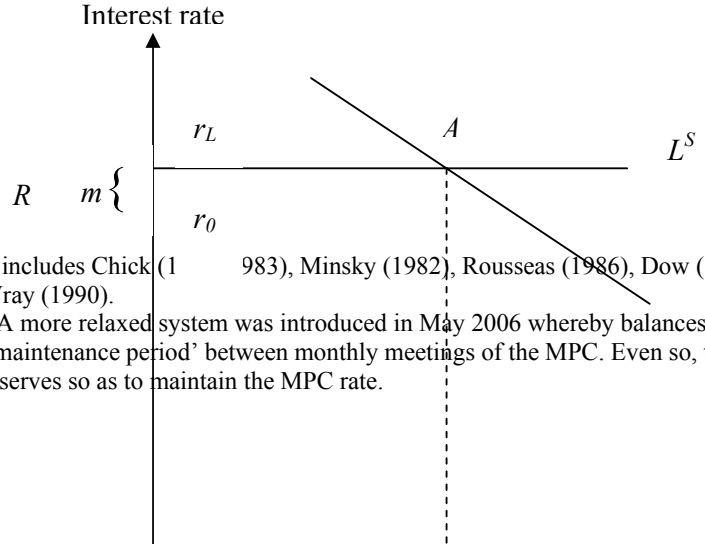
Given that the money supply is endogenously determined, this raises the question of how banks deal with the need for reserves. This is the basis of the accommodationist/structuralist argument wherein the former argues that central banks make reserves available on demand, either because they have an interest target or because they are obliged to do so in order to maintain the stability of the banking system, while the latter argues that banks can anyway circumvent a shortage of reserves by virtue of innovative behaviour. Details of this distinction (and the protagonists) have been widely discussed and limits of space oblige us to refer readers elsewhere (e.g. to Fontana, 2003; Dow, 2006; Lavoie, 2006). What is of some interest here, however, is that the mention of liquidity preference (or a demand for monetary assets) appears to be sufficient qualification to enter the structuralist club. It is not immediately clear (to the present author, anyway) why this should be the case, except that once we introduce the issue of 'demand' we raise the possibility that the endogenous growth of the money supply might be accompanied by rising interest rates and this is one of the consequences that would follow from binding reserve constraints and, indeed, would be one of the incentives driving banks' innovation to minimise such constraints. But I should stress that when I raised the question of the 'demand for endogenous money' in the debate with Basil Moore (Howells, 1995 and 1997; Moore 1997) and of the role of demand in representations using interest-money space (Arestis and Howells, 1996) I intended no contribution to the accommodationist/structuralist debate and have been surprised (and flattered) to be linked with such illustrious company.[10] For the record, my view on this particular issue is, I think, that both processes are central to endogeneity but their relative importance depends upon the period under review. Clearly banks do innovate and much of the time the incentive is provided by a desire to outwit the authorities. (See Chick and Dow (2002) for a discussion in connection with capital adequacy requirements). But this process takes time and a reserve shortage in a system which requires banks to hold daily positive balances at the central bank can only be met by *immediate* accommodation.[11] But a recognition that demand matters to a sensible exposition of endogenous money does not (it seems to me) commit one to a pro-structuralist view. Since we have said all along that simply trying to cast a representation of endogenous money in interest-money space is so unsatisfactory, then one might think that using the same space to discuss subtleties like the accommodationist/structuralist debate is asking for trouble.

We turn now to more recent, and promising, developments.

3. Recent improvements

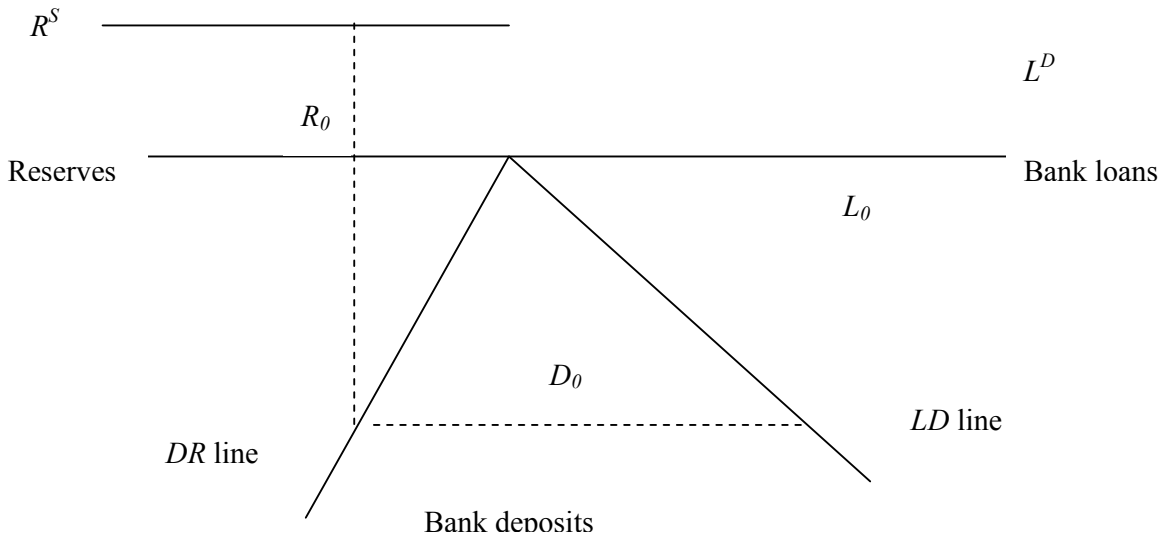
Fontana (2006) offers the following diagram as a better alternative to capturing the key features of endogenous money. It is essentially the same as the diagram in Fontana (2003) and we explain it as briefly as possible in order, subsequently, to illustrate its strengths and weaknesses.

Fig. 1



[10] In Fontana's (2003) survey it also includes Chick (1983), Minsky (1982), Rousseas (1986), Dow (1997), Palley (1996), Sawyer (1996) and Wray (1990).

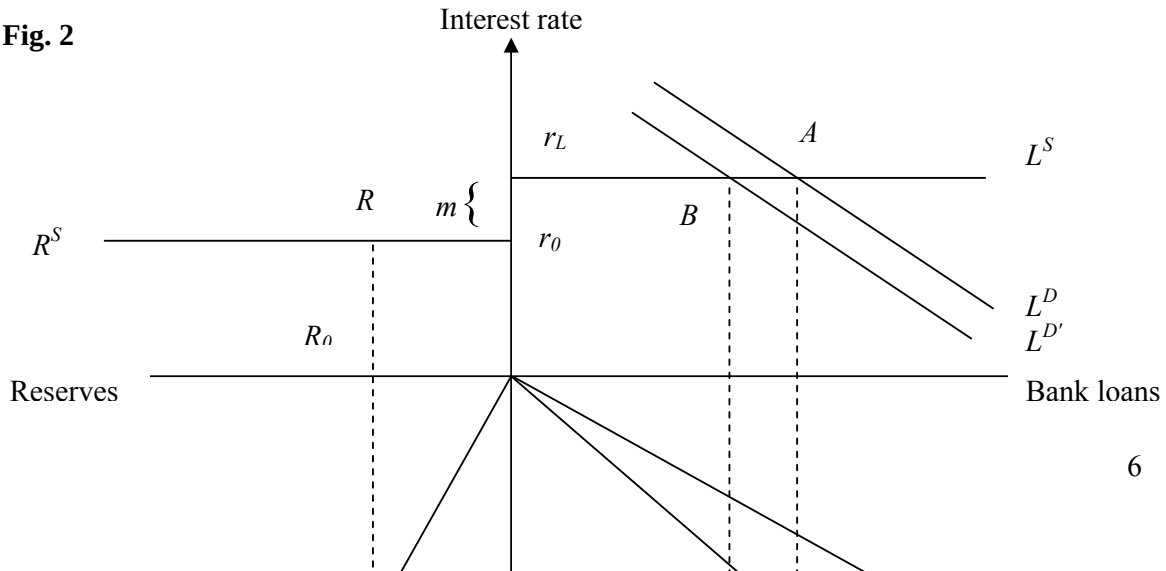
[11] As used to be the case in the UK. A more relaxed system was introduced in May 2006 whereby balances have to be positive only averaged over the 'maintenance period' between monthly meetings of the MPC. Even so, the Bank of England endeavours to provide reserves so as to maintain the MPC rate.

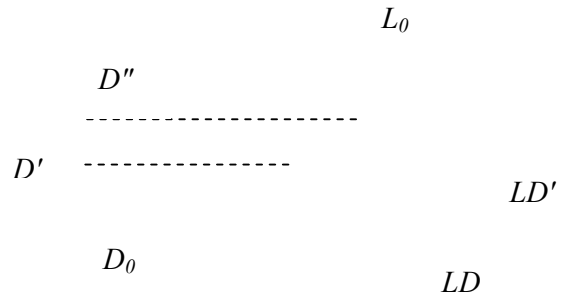


Firstly, the diagram depicts flows. Hence, at the current rate of interest charged on loans, r_L, net new loans are being created at the rate L_0. This creates *new* deposits at the rate of D_0 which requires reserves to expand at the rate R_0. The rate of interest charged on loans is a mark up on the official rate r_0 at which the central bank is prepared to make available whatever reserves are required by the banking system. By representing flows, the diagram captures the most basic and fundamental insight of an endogenous money regime. If the authorities sit on their hands, money and credit grow at their current rate. Growth is the norm. If the authorities intervene, the intervention changes the *growth rate*. By contrast, in an exogenous regime, if the authorities do nothing, the money supply is fixed.

For a second interesting feature, let us begin by looking at the lower-right quadrant, which expresses the 'loans create deposits' principle. As drawn, the *LD* (better understood as the *L=D*) curve passes through the origin at 45-degrees to the bank loans/ bank deposits axes. What Fontana does not make clear is that this line is drawn for a given opportunity cost of money – given in the sense of *fixed*, not given in the sense of unique. If we make that adjustment, then we can see that the diagram can be used to explicate the process that we mentioned earlier, whereby the *ex ante* demands for loans and deposits can be reconciled *ex post*. Suppose for illustration that we repeat the case we had earlier whereby a decline in liquidity preference means that the current flow of net new loans creates *ex ante* an expansion of deposits which exceeds the community's willingness to hold them.

Fig. 2



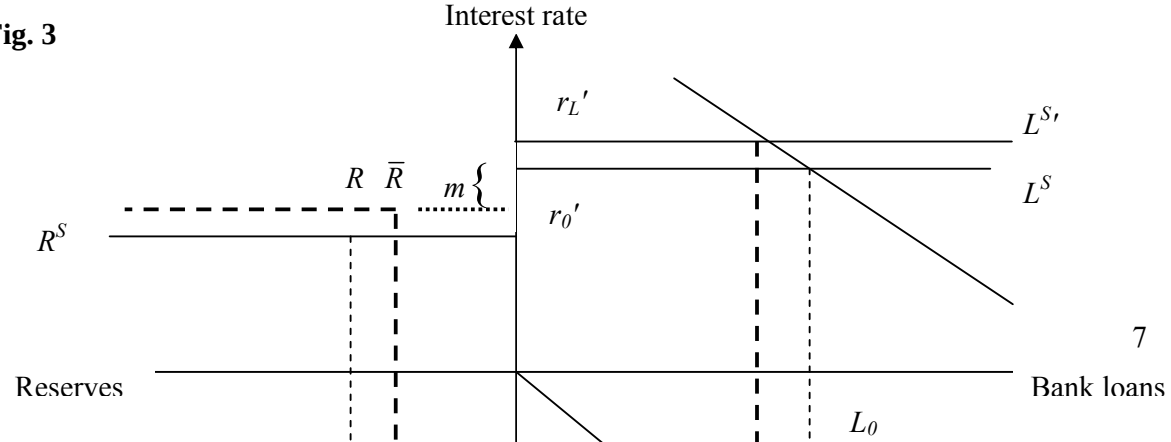


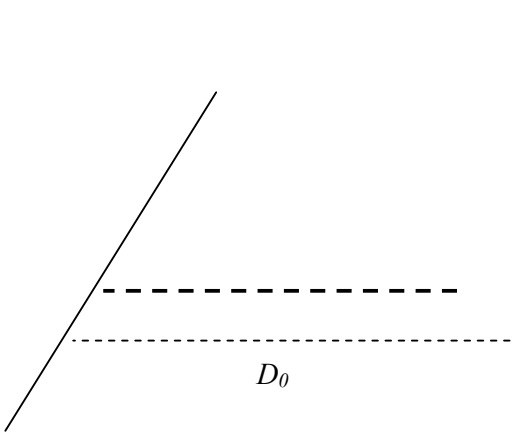
Initially, the *LD* line rotates anti-clockwise temporarily to *LD′* as the community attempts to hold fewer additional deposits than the current flow being generated by the demand for credit (*ex ante* desired deposits groing at *D″* against *ex ante* loan growth of L_0). This attempt involves exchanging deposits for non-money assets. In the aggregate, of course, this must fail, but prices will rise and yields will fall. As a result of the fall in the bond rate, non-bank finance becomes cheaper and in the upper-right quadrant, the demand for loans curve shifts inwards (to $L^{D'}$). At the same time, the interest rate adjustment that is causing the shift of L^D is causing the opportunity cost of holding money to fall producing a willingness to hold *D′* (growth in) deposits rather than *D″*. When the change in relative rates is complete, the *LD* curve resumes its original position and loans and deposits grow in step at *B* and at *D′* (rather than *A* and D_0).

By comparison, two other issues are easily dealt with. The difference between r_L and r_0 is the banks' mark-up over the official rate. Changes in this spread, a matter of commercial judgement for banks, can be shown by a change in *m*. Other things being equal, an increase in banks' risk aversion (for example) is shown by an increase in *m* and an upward shift in L^S. Loans, deposits and the demand for reserves all grow more slowly. Given a negative interest-elasticity in the demand for loans, the flow of new loans (and deposits) is reduced. In the diagonally opposite quadrant, changes in banks' desire for liquidity can be shown by rotations in the *DR* curve. For the UK, where banks' holdings of reserves are approximately 0.5 per cent of deposits, the *DR* line should be drawn very close indeed to the bank deposit axis. An increase in that ratio (perfectly possible in the UK where the reserve ratio is entirely prudential) would be shown by a clockwise rotation and, other things being unchanged, an increase in the growth rate of reserves (relative to loans and deposits). In practice, of course, one could easily imagine that the two events are linked. Banks, being more cautious, increase the mark up to reduce their lending and at the same time seek to operate with a higher degree of liquidity. In this case, the flow of new loans and deposits decreases and, with a clockwise rotation of the *DR* line, the *existing* flow rate of additional reserves serves to increase banks' liquidity.

We can also use the diagram to illustrate aspects of the accommodationist/structuralist debate. (See Fontana, 2003, pp.301-05). So far, we have assumed that reserves are forthcoming in any quantity demanded by banks (shown by the *DR* line). But, in the structuralist view, they not be. We can easily impose a constraint on reserve growth, limiting it to $\bar{R}$ in fig. 3.

Fig. 3



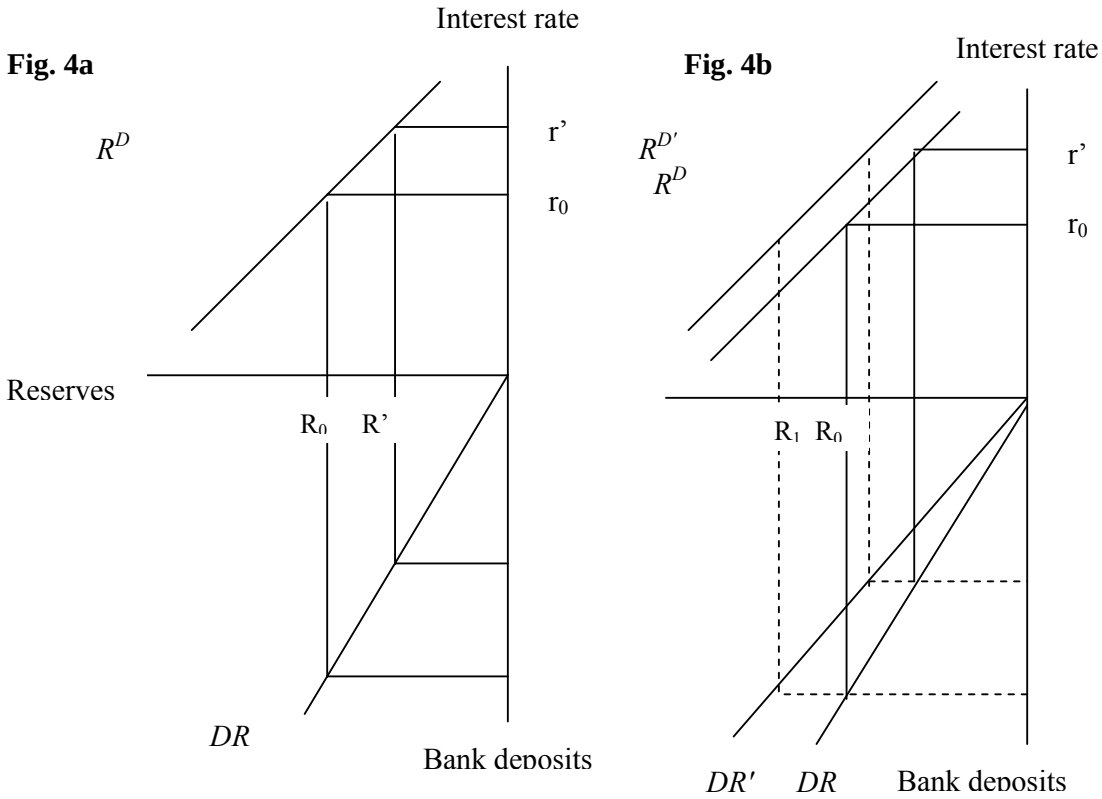


However, while this is easily done in the figure, its interpretation requires considerable care. One interpretation goes as follows. Clearly, as things stand there is an excess demand for reserves. If the central bank holds to its restrictive (non-accommodating) position, then the supply curve of reserves becomes vertical (the *flow*is fixed). Bidding for the limited additional reserves will raise inter-bank rates. Assuming a fixed mark-up, this is passed on as a higher lending rate (r_L') and we move up the L^D curve. The flow of loans (and new deposits) is reduced. Notice, though, that we are now treating the interest rate as the *market* price of reserves and not necessarily the rate fixed by the authorities. Notice, also, that this presupposes that the central bank *is* able to restrict the growth of reserves, independently of the interest rate that it charges. We are back to some sort of monetary base control, albeit in a dynamic setting – aimed at the growth rate of reserves rather than the absolute amount. This interpretation is equivalent to making the money supply exogenous.

Knowing how central banks actually work, a better interpretation is that the central bank increases the rate on reserves (by announcement), banks raise their lending rates (assume the mark-up is fixed) and the reduction in reserve growth is demand-determined. If that is the case, then once the change in rates has taken place, the growth rate of reserves becomes elastic again at the new rate of interest but the central bank has the satisfaction of knowing that whatever growth rate emerges, it will be slower than it would have been prior to the rise in rates.

In his 2003 paper Fontana depicts the supply of reserves in the top-left quadrant as a stepped line, ascending as we move to the left. This is his way (p.303) of representing the structuralist/accommodationist debate. In the horizontal sections of the 'curve' the central bank accommodates the demand for reserves, but the fact that it is less than wholly accommodating is shown by the rise in interest rates as the growth rate of reserves increases. Presumably he would say that a greater or lesser degree of accommodation could be shown by the frequency (and size) of the increases. The steeper the staircase, the less accommodating is the central bank.

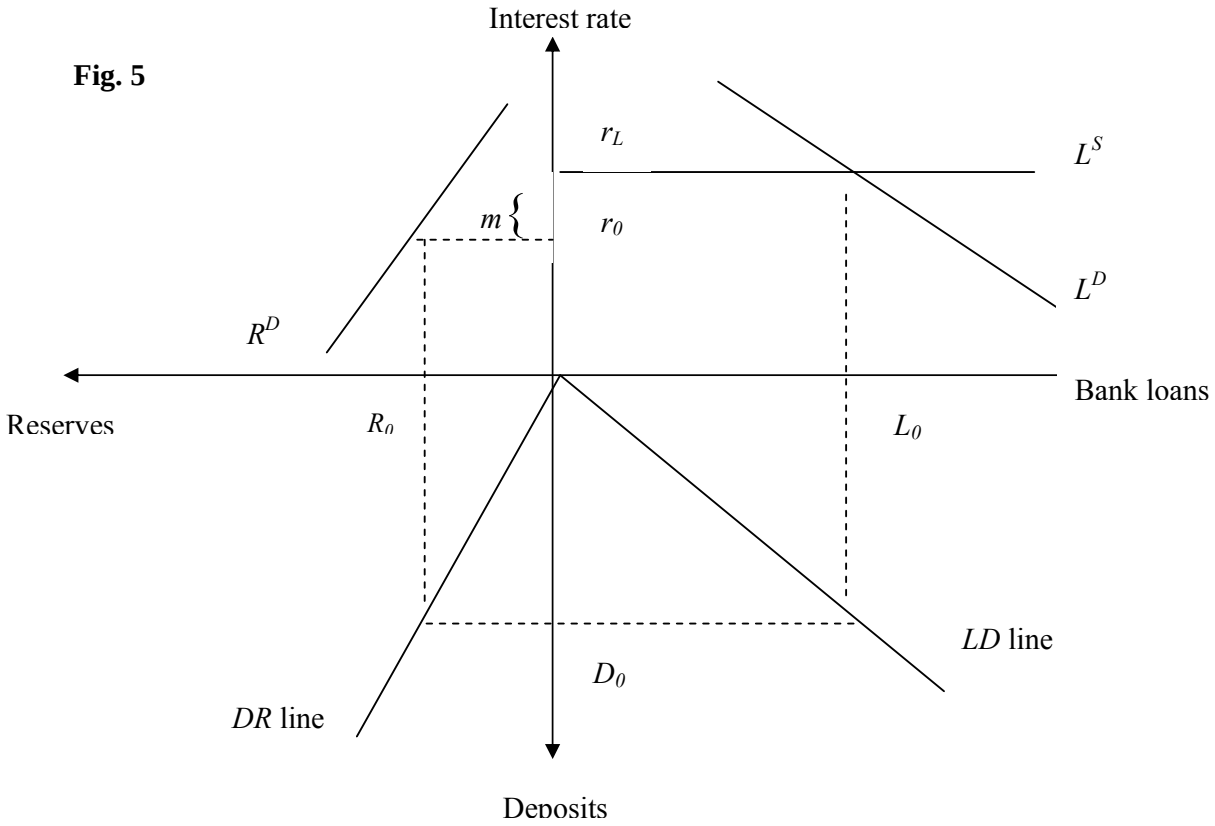
Maybe we can improve on this. Firstly, given the *DR* line, it is not clear why there should be any variation in the rate at which new reserves are required at a given rate of interest. This is because the demand for additional reserves originates with the demand for new loans and this is determined through the mark-up by the rate of interest set by the central bank. This is most easily seen if we go back to fig. 1. A rise in the official rate raises the loan rate and reduces the demand for net new loans. Given *L=D* and the *DR* line, the demand for additional reserves is pre-determined. If the official rate rises, we can read off a new demand for additional reserves and vice versa if the official rate is reduced. In other words, what we have in the upper-left quadrant is a downward-sloping demand curve for reserves. Now, given that in practice the only instrument available to a central bank is the rate of interest, it is not entirely clear how an excess demand for reserves, which structuralism poses, can emerge.



This does not mean that the demand for reserves cannot *shift.* Recall that we earlier said that rotations of the *DR* line can be used to show changes in banks' liquidity preference or their degree of risk aversion. In fig. 4 we have taken just the left-hand quadrants of the diagram. Fig. 4a shows how a demand curve for reserves can be derived from the growth rate of deposits (generated by new loans and determined by the rate of interest). Fig. 4b re-draws the demand curve to show the effect of a desire to be more liquid for a given level of loan/deposit activity. A rotation of the *DR* line illustrates a change in the desire for additional reserves at a given rate of interest. In fig. 4b the demand has increased. Suppose that the central bank has set the official rate at r_0. Originally, this produced a flow of new loans such that banks required reserves to grow at R_0. With the increased desire for liquidity, however, that growth rate has now risen to R_1. In a sense therefore, we have a situation in which banks are potentially 'short' of reserves. But there is no question that the central bank will not accommodate the immediate 'shortage'. It may do so at the going rate of interest or it may accommodate while resolving to rein in the growth by raising rates at the next MPC/FOMC meeting, or it might raise rates immediately. But there is no question about accommodation being forthcoming in the short-run.

But this need not rule out the more interesting part of the structuralist contribution, which is that banks innovate so as to economise on reserves and this further reduces the central bank's leverage over the money supply. Clearly they do. Encouraging clients to hold time instead of sight deposits, developing a market for CDs (so as to offer time deposits with sight deposit liquidity) are innovations which both lead to a reduced need to hold reserves. The development of an interbank market in which large quantities of funds can be borrowed on demand reduces the danger of a reserve shortage and enables individual banks to operate with lower reserves. Such developments rotate the *DR* line *anti*-clockwise and shift the demand curve for reserves progressively towards the origin. But, as we said earlier, this takes time and while it is happening the central bank continues to accommodate.

Fig. 5



Towards the end of section 2, we said that the accommodationist/structuralist debate was not well-served by attempts to present the issue as one of the slope of a money (or credit) supply curve in interest-money space. We can now say that it cannot be captured by the slope of a bank reserve supply curve.[12]

Fig. 5 is a re-drawing of Fontana's diagram (Fig. 1) to incorporate this modification to the top-left quadrant. It shows (much as before) an interest rate set by the central bank at r_0, which, with a mark-up m, gives a loan rate of r_L. Subject to credit-worthiness, banks meet the (flow) demand for net new loans arising at that rate of interest. Here the flow of new loans is L_0 and this gives a flow of (willingly-held) new deposits of D_0. Under present, but variable, institutional arrangements, this requires an expansion of reserves at the rate shown by R_0 which the central bank accommodates. Changes in a wide range of bank and non-bank behaviour can be incorporated. For example, the mark up is variable, the L^D curve can shift, and the *LD* and *DR* lines can rotate causing a shift in the R^D curve.

4. Macroeconomics without the *LM* curve

From a monetary point of view the weaknesses of the *IS/LM* model are well-known.

- The money supply is fixed exogenously by the central bank
- The policy instrument is the money stock
- In the absence of policy intervention the money supply is fixed
- Policy interventions are transmitted to the real economy through real balance effects

[12] Indeed, it maybe that the whole debate needs revisiting. It is difficult to see why the two positions should be so frequently presented as opposed to one another. (See Lavoie, 2006 and Dow, 2006).

All of these are so patently misleading as to make *IS/LM* a thoroughly unsuitable pedagogic device for students who are alert to what actually happens as widely reported by the media.

Furthermore, things get worse when *IS/LM* is combined with an *AD/AS* framework which links aggregate demand to output and the *price level*, when current debates in macroeconomics require a link between demand, output and the rate of inflation.

In 2000, David Romer courageously suggested dispensing with the *LM* curve altogether. By way of alternative, he proposed an *IS-MP-IA*[13] model, central to which is the replacement of the *LM* curve with a rate of interest imposed by the central bank, represented by a horizontal line, designated appropriately the *M*(onetary) *P*(olicy) curve. Further developments allowed him to re-introduce the *IS* curve and to derive an aggregate demand curve in output/*inflation* space.

Given that Romer was amongst the first to offer an alternative to the conventional *IS/LM/AS* model it seems churlish to criticise. And, indeed, there is little about the proposal that is objectionable – so much so that one might wonder why it has not been taken up more enthusiastically. [14] Nonetheless, what is finding its way into textbooks (we shall see) is slightly different and is generally more explicit about the supply side.

From a strictly monetary angle, Romer's model is less attractive than it might be since he finds it hard to make a clean break with the idea that central banks can control the quantity of money, presenting the use of an interest rate instrument as a *choice.* In a section on 'The Money Market' Romer gives an explanation of how the central bank imposes its chosen rate '…by injecting or draining high-powered money…' (p.162). In so far as the focus is on high-powered (rather than broader measures of) money, this is correct. But when it comes to explaining how operations on the monetary base influence 'the' real rate of interest which (we saw above) is the central bank's policy instrument, we switch to changes in the quantity of broad money and real balance effects. A change in reserves causes a change in broad money and by '…the standard experiment of the central bank increasing the money supply when the money market is in equilibrium…the supply of real balances now exceeds the demand…' (p.163). This description is a long way from the reality recognised by economists working with central banks which is that central banks set the rate of interest by adjusting the price at which they refinance past borrowings of reserves and banks then convert that cost of reserves to a market rate of interest (relevant to the *IS* curve, for example) by a variable mark up. It also understates the extent to which Woodford and other members of the 'new consensus' have moved in recognising the hegemony of the interest rate instrument:

> It is often supposed that the key to understanding the effects of monetary policy on inflation must always be the quantity theory of money... It may then be concluded that what matters about *any* monetary policy is the implied path of the money supply... From such a perspective, it might seem that a clearer understanding of the consequences of a central bank's actions would be facilitated by an explicit focus on what evolution of the money supply the bank intends to bring about – that is by monetary targeting... The present study aims to show that the basic premise of such a criticism is incorrect. One of the primary goals ... of this book is the development of a theoretical framework in which the consequences of alternative interest-rate rules can be analyzed, *which does not require that they first be translated into equivalent rules for the evolution of the money supply'*. (Woodford, 2003, p.48. Second emphasis added).

Since Romer, Bofinger, Mayer and Wollmerhäuser (BMW) (2006) have developed a more comprehensive framework 'for teaching monetary economics' – more comprehensive in the sense that it is more explicit about the supply side and introduces monetary policy rules (e.g. after Taylor), and central bank credibility. More interesting in many ways are the attempts to 'apply' these models, in the sense of incorporating them into mainstream macro teaching. As we've noted

[13] Standing for *I*=*S*/Monetary Policy/Inflation Adjustment
[14] See note 4 above.

already, there are precious few such but Taylor (2001) and, most recently, Carlin and Soskice (2006) are notable examples.

The C-S book is doubly interesting since it represents one of the first attempts to introduce a more realistic treatment of money into a mainstream textbook and also because it starts from a position which embraces more wholeheartedly the essence of the new consensus. There is no reference to central banks controlling stocks of narrow (or broad) money with a view to targeting interest rates. In this sense the 'rejection' of the *LM* curve is more complete than it is in the Romer approach. In Carlin and Soskice, the interest rate is set as part of a Taylor-*type* rule, and in so far as a mechanism for setting such a rate is required it is consistent with Woodford (2003).

The basic model in Carlin and Soskice is developed over pages 81-87. It consists of three equations and is described as the *IS-PC-MR* model. As with Romer (and BMW), the *IS* curve remains but Romer's 'inflation adjustment' is replaced by an 'inertia-augmented Phillips curve' and 'monetary policy' is modelled more explicitly as a 'monetary rule'. (Notice that it is a *monetary policy* rule and not an *interest rate* rule).

The starting point is figure 7 in which the central bank is assumed to have an inflation target of 2 per cent. Initially, the economy is in equilibrium at *A*, with inflation running at that level. Output is at its 'natural' level (on a long-run vertical Phillips curve) so there is no output gap to put positive (or negative) pressure on inflation. An inflation shock is introduced which moves the economy to *B* at which inflation is 6 per cent. In order to return to target, the central bank raises the real interest rate[15] and pushes output below its natural level and we move down the short-run Phillips curve (drawn for $\pi^l = 6$) to the point labelled *F*. Notice that *F* is selected because the central bank is at a point tangential to the best available indifference curve at that combination of output and inflation. The indifference curve represents the output/inflation trade-off (the degree of inflation aversion) for that particular central bank. (A more inflation averse central bank would have a different indifference map and would move the economy to a point on PC ($\pi^l = 6$) to the left of *F*).[16] As the inflation rate falls to 5 per cent, the short-run PC shifts down to ($\pi^l = 5$). The central bank can then lower the real interest rate, allowing output to rise, so the economy moves to *F'* and by this process the central bank steers the economy back to equilibrium at *A*.

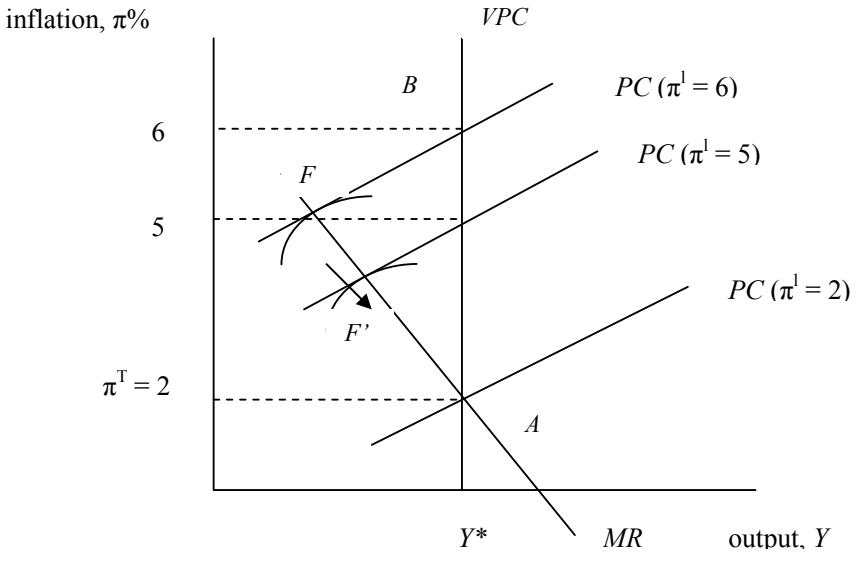


Fig. 7

[15] Carlin and Soskice (p.84) make the same point as Romer, that the central bank strictly speaking sets the *nominal* interest rate but does so with a view to achieving a *real* interest rate.

[16] The indifference curves in figure 7 are segments of a series of concentric rings centred on *A*. If the central bank's loss function gives equal weight to inflation and output, the rings will be perfect circles. If the central bank puts more weight on inflation, the rings will be ellipsoid (stretched) in the horizontal plane. Hence greater inflation version creates a tangent 'further down' the *PC*.

The next step is to introduce the *IS* curve and the real rate of interest. This is done in the upper part of figure 8. To begin with the economy is in equilibrium, shown in both panels by the point *A*. Notice that in the upper panel, this includes a real rate of interest identified as r_s (a 'stabilising' rate of interest which maintains a zero output gap). In the lower part, we then have an approximate replay of figure 7. There is an inflation shock which takes the economy from equilibrium at *A* to a rate of inflation of 4 per cent (at *B*). In figure 9a, the central bank now raises the real rate of interest (to r') which has the effect of moving us up the *IS* curve to *C* at which the level of output is reduced. (In the lower panel we move down the PC $\pi^1 = 4$). As the rate of inflation subsides to 3 per cent, the real rate is reduced allowing some expansion of output. We are now on PC ($\pi^1 = 3$) but since we are still to the left of *Y** inflation continues to fall. This allows a further reduction in the real interest rate when inflation comes back to target at 2 per cent.

Clearly, there are substantial similarities with Romer. The dynamics are essentially the same, for example. There is an *implicit* aggregate demand curve, with inflation on the vertical axis, which is *made* downward-sloping by virtue of the central bank's reaction to inflation. But in Carlin and Soskice they are spelt out in more detail and the reaction function of the central bank (here the 'monetary rule') is clearer. The big difference comes, however, when we look at later pages where Carlin and Soskice discuss 'How the *MR* relates to the *LM* curve' (pp.92-3). The first point they make is that the choice of model (*MR* or *LM*) must depend upon the nature of the nature of the monetary regime. 'If the central bank is using an *interest-rate based monetary rule* ...the correct model is the 3-equation model with the *MR*. This is often called an inflation-targeting regime' (p.92). Of course, they recognise that there is at any time a stock of monetary assets in existence and that these must be held by the non-bank private sector (since that is how money is defined). In that sense there is a permanent equilibrium between the demand for money and its supply. In an inflation targeting model one can *imagine* an *LM* curve if one so chooses: '...it goes through the intersection of the *IS* curve and the interest rate set by the central bank but *it plays no role in fixing the position of the economy in terms of output, inflation or the interest rate'* (p.93. Emphasis added). In a footnote they add '...in a world in which the central bank sets the interest rate, the causality goes from $i \rightarrow L \rightarrow M \rightarrow H$ whereas in the traditional *LM* model the causality is reversed from: $H \rightarrow M \rightarrow i$, where *H* is high powered money'. If only the '*L*' were the demand *loans* rather than the demand for *money*, we would have the perfect statement of the post-Keynesian case.

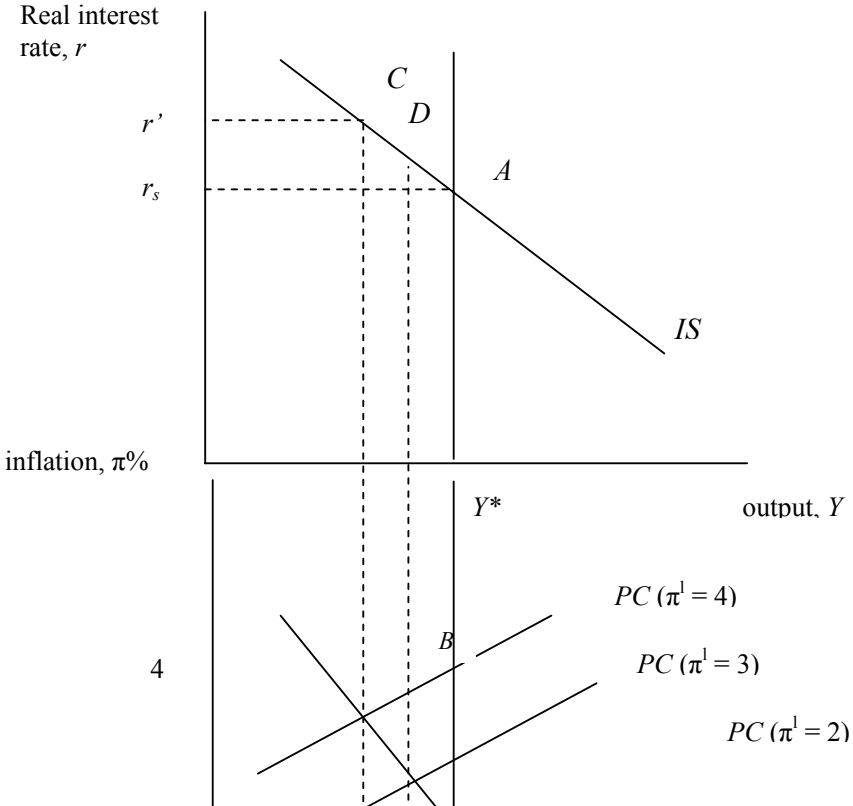
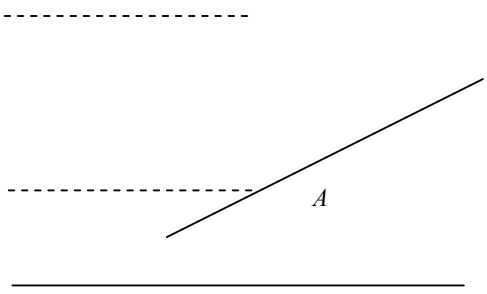


Fig. 8a

Fig. 8b



5. Bringing the pieces together

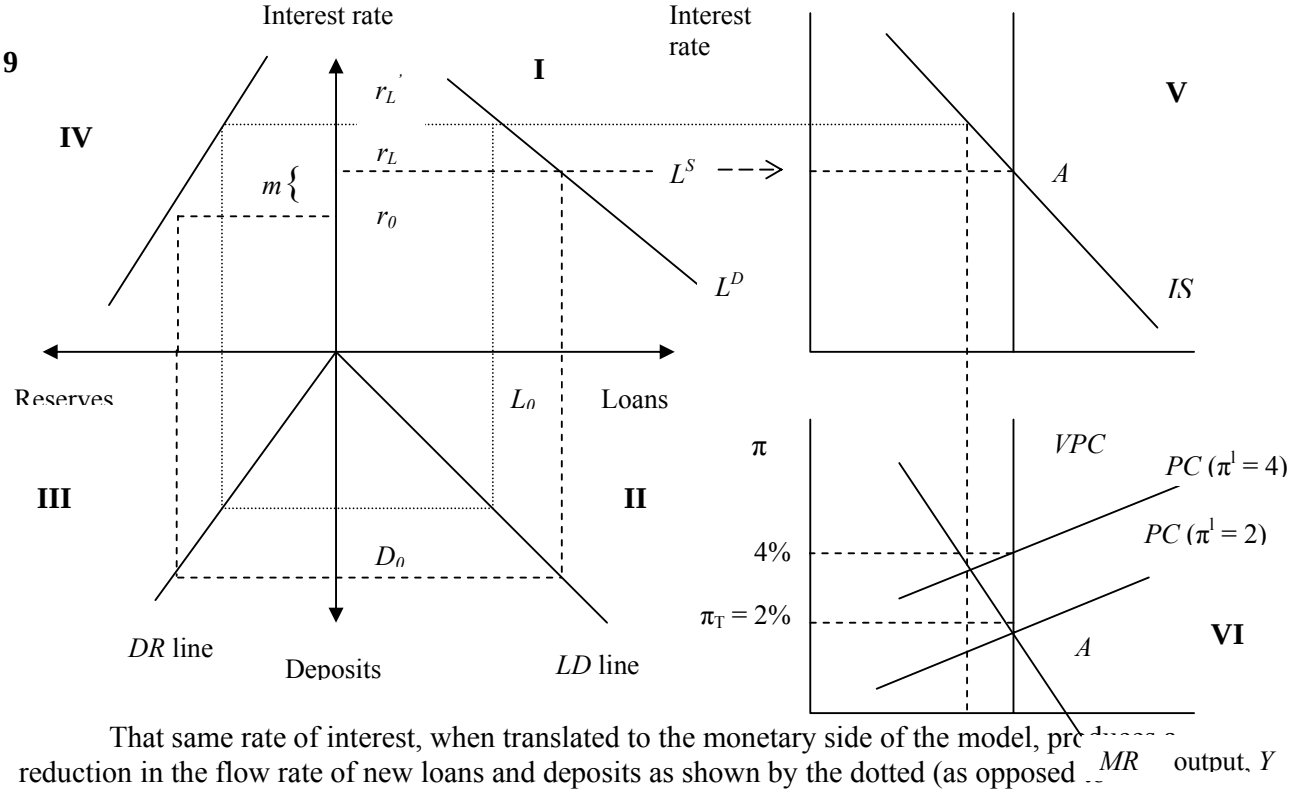
In figure 8, from C-S, we have a model which incorporates many of the features of a mainstream macromodel wherein the Phillips curve is vertical in the long-run but monetary policy can cause deviations from the equilibrium level of output for as long as it takes for price setting to catch up with the current rate of inflation. Furthermore, it incorporates much of the emerging consensus about modern monetary regimes and the way in which monetary policy is conducted. For example, the central bank sets interest rates and the money supply is endogenously determined. The rate of interest for this purpose is whatever rate is relevant to the central bank's refinancing of bank reserves (a very short-term repo rate in most regimes) and while it is only the nominal rate that the central bank can control directly this rate is set and revised at short intervals in order to produce the real rate required to adjust or maintain the rate of inflation. Naturally, many post-Keynesians would take issue with the idea that policy affects real variables only in the short-run. But it would not be difficult to modify the model to allow potential output to respond positively to high levels of actual output in the spirit of Arestis and Sawyer (2005). Our point in this paper is that we should at least recognise that 'mainstream' economics has woken up to and is trying to present the monetary side of the economy with reference to reality. There should be *some* scope at least for pleasure on earth when sinners repent.

In figure 5 (adapted from Fontana, 2006) we have a model which incorporates not just the basic ideas of endogenous money, but one which can be used also to debate some of the finer points of post Keynesian debate. The question for this section is whether we can bring the two together in any satisfactory way. The common, and central, feature of both is that the policy instrument is the rate of interest and money is endogenously determined. This features in the *IS-MR-PC* model in the upper panel where it determines the position of the economy on the *IS* curve. It features in the Fontana model as the repo rate and (when a mark-up is added) as the loan rate. There are, of course, hundreds of interest rates and we have warned (in section 2) against treating them as all equivalent or even as a fixed set of relationships. Nonetheless, models must simplify and it seems reasonable to suggest that Fontana's bank loan rate can be interpreted as the relevant rate of interest in an *IS* diagram. After all, for some firms at certain times, the bank loan rate *will be* the rate at which they finance investment; at others, where maybe they are using bond finance, the *movements* in bond and loan rates should be similar. Furthermore, in Fontana the L^D curve is drawn for a given rate of inflation. The flow of net new loans is positive partly because of the upward trend in the price level. If this trend increases, then the L^D curve shifts. For a *given* curve, therefore, we have a *given* rate of inflation and any change in r_0/r_L must be equivalent to a change in the real rate. There seems no obvious reason, therefore, why we should not treat the rate of interest in both models as a real rate and regard the loan rate and the rate in the *IS* diagram as equivalent.

Taking the same approach that we followed in figure 8, we can see that the interactions between the two models produces perfectly sensible outcomes. We begin in the Phillips curve and *IS* diagrams in equilibrium at *A*. Output is at its natural level because the central bank has set the nominal rate at r_0 which translates into the appropriate real rate. Inflation is on target at 2 per

cent. Given this rate of interest and the state of the economy, the demand for new loans is creating new deposits at the rate D_0 as shown in the Fontana diagram. Now, as before, we introduce an inflation shock shown in the Phillips curve diagram as a shift in the short-run curve to *PC* ($\pi^1 = 4$). To bring inflation back to its target, the central bank increases the repo rate (r_0 to r_0') so as to raise the *real* rate of interest charged on loans (r_L to r_L') which pushes the economy down *PC* ($\pi^1 = 4$) and up the *IS* curve.

Fig. 9

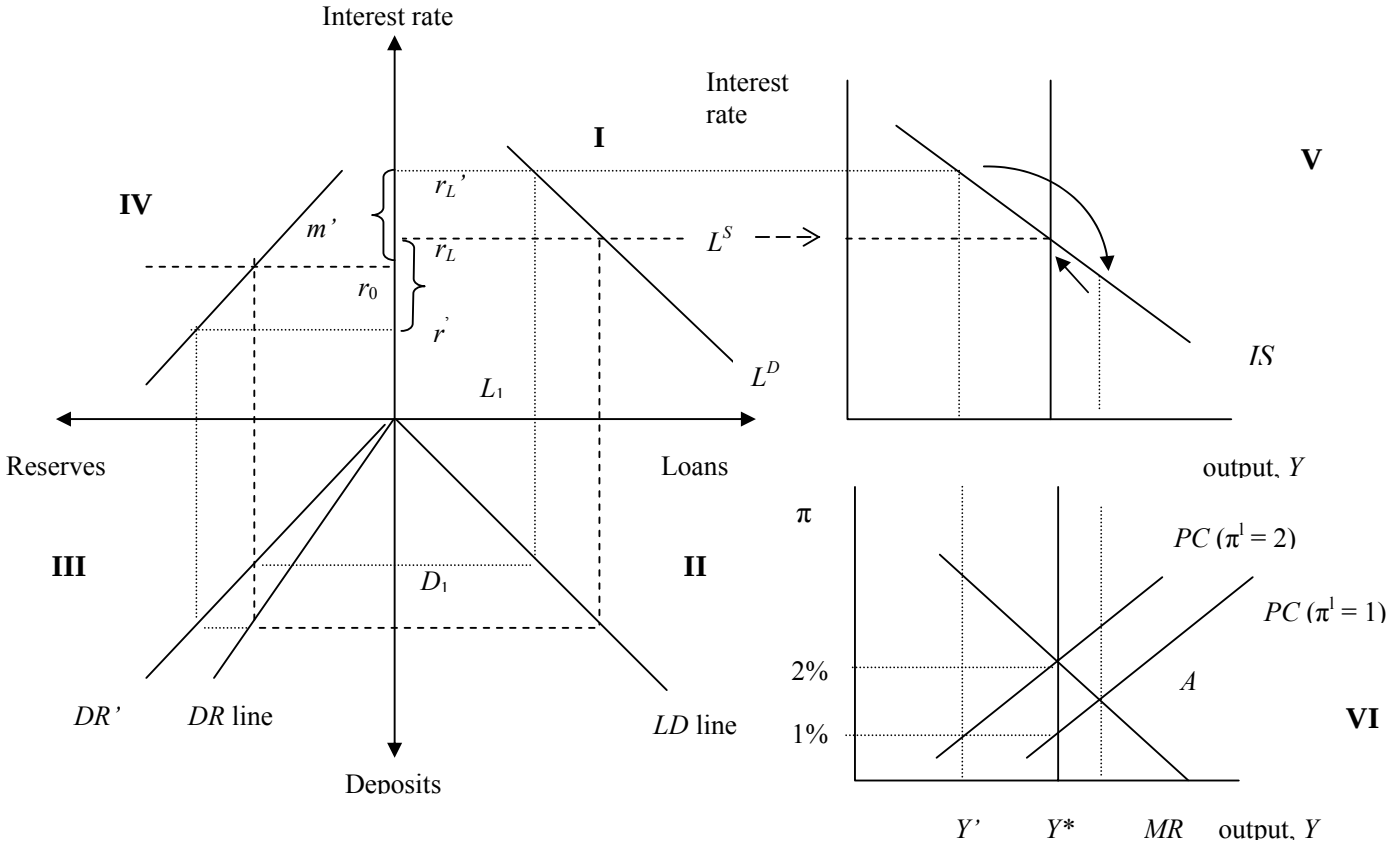


That same rate of interest, when translated to the monetary side of the model, produces a reduction in the flow rate of new loans and deposits as shown by the dotted (as opposed to dashed) lines. We conclude from this that our post Keynesian representation of the monetary sector is able to produce a 'sensible' reaction to a macroeconomic shock.

For good measure, we now run the test the other way round, in order to see whether a 'post-Keynesian' shock originating in the monetary sector can be sensibly represented in both parts of the model. Starting from equilibrium we take the case mentioned in section 3 whereby there is an increase in banks' liquidity preference. This involves an increase in banks' mark-up over the official rate and an increase demand for reserves relative to deposits. Figure 10 refers.

We beginin QI where banks increase their mark up. With the repo rate unchanged at r_0, the lending rate rises from r_L to r_L'. In quadrant V, this pushed us up the *IS* curve and in quadrant VI we move down *PC* ($\pi^1 = 2$). Output and inflation are now below target (at Y'/π=1%). In the monetary sector, QI and QII show a slower growth of credi and money (L_1/D_1). In QIV this would normally mean a slower growth in required reserves. However, banks' liquidity preference has increased so we shall assume that the demand continues to expand at its original rate, in spite of the slower expansion of loans and deposits. Consequently *DR* has rotated to *DR'* (QIII).

Back in the goods market (QVI) the *PC* will shift to *PC* ($\pi^1 = 1$) as inflation inertia is overcome. If the situation persists there will be repeated downward shifts of the *PC*. However, the situation can be stabilised at *Y**/1% if the central bank reduces the repo rate so as to bring r_L' back to r_L. The economy will be restored to its original position on the *IS* curve but inflation will\be below target. To restore the original equilibrium at *Y**/ 2%, the central bank will need to lower the repo rate further ($r_L'' < r_L$) in order to move the economy temporarily above *Y**. This



takes us to A on PC ($\pi^1 = 1$). For reasons of clarity this is shown by the large arrow in QV; for the same reasons, the required movements in the repo and loan rates in QIV/QVI have to be imagined. As the PC moves back to PC ($\pi^1 = 2$), the central bank raises the repo rate to bring r_L" up to the original loan rate, r_L. (The small arrow in QV). Notice that this new equilibrium is associated with the repo rate (at r') below its original level since market rates now enjoy a larger mark-up. Credit and money growth are returned to their original level (L_0/D_0), as the original growth of nominal GDP is restored in the goods market. However, these new conditions are associated with a more rapid expansion of reserves to meet banks' extra demands for liquidity. The new flow demand for reserves can be read off the DR' line.

6. Conclusion

In the last few years there has been a long overdue recognition in mainstream macroeconomics that persisting with the fiction of a fixed money supply under the discretionary control of the central bank has to be abandoned. Attempts to incorporate this into the teaching environment, however, have been painfully slow. Furthermore, the current suggestions overlook entirely a large amount of work that has been done in post-Keynesian economics over more than thirty years to develop a realistic and detailed analysis of the monetary sector.

Consequently, there is a danger that the efforts of post-Keynesian scholars will get much less than their just desserts for the spread of a more enlightened and informed macroeconomics. In this paper we have shown just one way in which much that is familiar in post-Keynesian monetary economics can be used to enhance a more realistic macroeconomics.

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