CORRECTION

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Monetary base control

The table on page 151 should read as follows:

	Bank of England			Banking sector			Non-bank private sector	
	Liabilities	Assets		Liabilities	Assets		Liabilities	Assets
Position before the change								
Bankers' balances	1.5		Deposits of non-bank private sector	100.0		Deposits with banking sector		100.0
Vault cash in commercial banks	4.0		Capital of banks	10.0		Equity holdings in banks		10.0
Notes in circulation with non-bank private sector	15.0		Bankers' balances		1.5	Notes		15.0
Public sector deposits at Bank of England	5.0		Vault cash		4.0			
			Liquid assets and advances		104.5			
	25.5	25.5		110.0	110.0		125.0	125.0
Position after the change								
Bankers' balances	1.4		Deposits of non-bank private sector	93.3		Deposits with banking sector		93.3
Vault cash in commercial banks	3.73		Capital of banks	10.0		Equity holdings in banks		10.0
Notes in circulation with non-bank private sector	14.1		Bankers' balances		1.4	Notes		14.1
Public sector deposits at Bank of England	6.0		Vault cash		3.73			
			Liquid assets and advances		98.17			
	25.23	25.23		103.3	103.3		117.4	117.4

Monetary base control

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Introduction

1 This article considers whether monetary base control should be the means by which the authorities control the monetary aggregates. We have approached this subject as economists rather than as representatives of the Bank of England, and we seek to contribute to what has hitherto in the United Kingdom been only a limited discussion. Many of the subjects raised in the discussion are candidates for detailed consideration on both a theoretical and a practical level. Moreover, the various proponents of monetary base control often have widely differing proposals in mind, a fact which significantly increases the scope of the analysis required. What follows in this article, therefore, is not intended to be an exhaustive treatment of the subject. In particular, it concentrates on the more theoretical, economic issues and only raises in passing some of the implications of the various proposals for the structure of existing financial markets and for the authorities' present methods of operation.

2 To this end, a brief background for the subject is provided in paragraphs 3–4. The monetary base is then defined (paragraphs 5–8), its historical relevance in the United Kingdom noted (paragraphs 9–12), and its possible theoretical relevance briefly set out (paragraphs 13–21). The various possible forms of control as we understand them are then considered; the implications of strict forms of control are outlined in paragraphs 22–42, and more relaxed versions are discussed in paragraphs 43–50. A brief summary of our views is provided in paragraph 51. There is also an appendix which discusses briefly certain aspects of the financial system in some major countries where the monetary base is rather more familiar than in the United Kingdom.

The background

3 In a number of countries, there are now formal monetary targets. Even where there are not, it is probably much more widely recognised than was the case, say, ten years ago that movements in the stock of money have considerable economic relevance, although the form and extent of this relevance are hotly debated.

4 Among those who believe that 'money matters', there is a group which considers that an appropriate degree of control over the rate of monetary growth can only be obtained by operating primarily to control the rate of growth of the monetary base.[1] To some in this group, current attempts in the United Kingdom to control sterling M_3 are wrongly directed, because the authorities are said to lack the means at present to achieve an adequate degree of short-term control over sterling M_3. The alternative proposed is that the authorities should seek to ensure the desired growth of whichever monetary aggregate they consider most appropriate by operating on the monetary base. Others in the group would go further and suggest that the monetary base—as well as being the means of control—could also be the appropriate target rather than (as in the United Kingdom, France or Western Germany) a broad monetary aggregate such as sterling M_3 or (as in Canada) a narrower monetary aggregate, M_1.

What is the monetary base?

5 In current economic literature, there is a generally accepted concept of 'high-powered money', which is thought of as the sum of the balance-sheet liabilities of the central bank (strictly speaking, the monetary authorities[2]) to the private sector. Thus, anything which leads the central bank to have reduced liabilities to the private sector (for example—and assuming that the Government banks with the central bank, as it does in the United Kingdom—an excess of tax receipts over expenditure, or net sales of government debt) acts to reduce the volume of high-powered money. The phrases 'high-powered money' and 'monetary base' are often used interchangeably. In this article, however, we should like to adopt a more precise terminology and use the phrase 'monetary base' to describe that set of the liabilities of the monetary authorities which they may seek particularly to control.

6 Exactly which liabilities should go into this set is no easy problem. In essence, the issue boils down to asking which set of their liabilities the monetary authorities think that they should control. Among the candidates for inclusion are:

(a) notes and coin in circulation with the public;
(b) notes and coin held by banks (vault cash);
(c) bankers' balances at the Bank of England;[3] and
(d) potential liabilities of the Bank of England, i.e. liabilities incurred as the counterpart to the assets that the Bank may have to assume because of commitments previously given or because of 'automatic' borrowing rights of others (in particular, the lender of last resort facilities to the discount market).

[1] There are also those who consider the relevance of the monetary base to be its value as a leading indicator rather than its potential as a control device. This view is considered further in paragraphs 44–6.

[2] For example, in the United Kingdom, the Bank of England issues notes, but coin is issued by a quite separate body (the Royal Mint).

[3] We have deliberately ignored the comparatively small balances held at the Bank of England by the non-bank sector.

7 The definitions actually adopted by those countries where the base is considered relevant vary quite widely (see appendix). In this article, we prefer to begin with a definition that covers just (b) and (c) of the above list, on the view that this pair—or alternatively (c) by itself[1]—might be operationally most relevant in the United Kingdom and also with the hope that this will make the subsequent discussion easier to handle without losing its general relevance. Thus, for example, the size of the base would be greatly increased by the inclusion of (a), notes and coin with the public. But the amount of currency so held is hardly a variable over which the authorities would (or could) seek control. In any case, if the aim is to influence some monetary aggregate consisting primarily of bank deposits, the relevant variable would seem to be that definition of the base—(b) and (c) or (c) alone—directly related to the assets of the banks. Otherwise variations in the non-bank private sector's demand for currency could lead to undesirable fluctuations in the growth of the monetary aggregates.

8 The argument over whether (d) should be included is rather different. Under strict forms of base control, such facilities would not exist and therefore the problem would not arise. However, where such facilities did exist, their inclusion would imply a relationship between the base and the *potential* rather than the actual stock of money. In general, proponents of base control have argued against a definition of this type and, although it has been adopted in certain countries at certain times, it is not considered further here.

The historical relevance of the monetary base in the United Kingdom

9 A banking system as we know it could not have developed had banks not learned how to make loans without collapsing, through want of liquidity, if some depositors wanted their money back. The first line of defence for any bank against such illiquidity was traditionally provided by holding a stock of generally acceptable assets—coin or notes 'behind the counter'. The second consisted of balances with other banks that could be used to obtain additional generally acceptable notes. As the Bank of England became increasingly important as a note issuer and as a 'central bank', it became increasingly convenient to hold Bank of England notes and balances at the Bank.

10 Over time, the liquidity of the banking system came to be increasingly assured by the Bank's extension of lender of last resort facilities to the discount houses (for then banks could safely make secured short-term deposits with the houses and have no doubts about the liquidity of these funds) and also by the extension of markets in liquid financial assets, notably Treasury bills. Thus, when we now think of the liquidity of a single bank, we consider the liquidity provided by the existence of markets on which it can quickly raise new debt or sell existing assets and not just of the level of its holdings of cash and balances at the Bank of England. Similarly, for the liquidity of the banking system as a whole, the relevant point is the preparedness of the central bank to provide unlimited support to the system in times of crisis, not banks' aggregate holdings of cash and bankers' balances.

11 Thus, when it became accepted practice after the Second World War for the London clearing banks to keep a minimum ratio of 8% of cash to deposits,[2] no operational relevance (in the sense of using the Bank's potential control over the supply of cash to restrict the level of bank deposits) was attributed to the ratio; in so far as the requirement had justification, it was prudential. Instead, the authorities were primarily concerned with the level and structure of interest rates, and they were consequently willing to ensure that the clearing banks did not go short of cash.[3] As a result, the clearing banks did not need to hold sizable excess cash reserves, and the recorded ratio was generally very close to 8%.

12 After 1971, even the 8% cash ratio was abolished, but the London clearing banks instead agreed to keep an average of 1½% of their eligible liabilities[4] in the form of non-interest-bearing balances at the Bank.[5] Even more obviously than with the 8% cash ratio, there has been no attempt to use this ratio as a device for imposing a ceiling on the stock of eligible liabilities. As before, the Bank of England has chosen—through its open-market operations and lender of last resort facilities—to concentrate on influencing short-term interest rates, being prepared always to provide funds requested by the banking system but on interest-rate terms of its own choosing.

Why the monetary base may be relevant

13 If banks have to maintain a minimum ratio of cash to deposits and if the central bank exercises sufficiently vigorously its undoubted potential power as 'the' source of cash, then clearly the size of the high-powered money base imposes a ceiling on the level of bank deposits and thus, indirectly, on the stock of money, however defined.

[1] The question of whether or not to include banks' holdings of vault cash in the definition of the monetary base raises a number of difficult questions. Since banks with differing kinds of business have differing operational needs to hold vault cash in the normal course of business, the issue of equity as between banks arises. If vault cash were to be excluded from the defined monetary base, however, banks could seek to adjust to their required cash ratio by making otherwise unnecessary transfers between vault cash and bankers' balances at the Bank. Such unnecessary transfers would have implications both for the Bank's ability to control the monetary base tightly and for costs.

[2] See paragraph 351 of the *Report of the Committee on the Working of the Monetary System* (the Radcliffe Committee). Cmnd. 827. (HM Stationery Office, 1959). The ratio could be met by any combination of vault cash and balances at the Bank.

[3] See 'The management of money day by day' in the March 1963 *Bulletin*, page 15.

[4] Broadly, for any bank, these equal sterling deposits excluding those with an original maturity of over two years, plus sterling resources obtained by switching foreign currency into sterling, less the bank's net holdings of claims on the rest of the banking system.

[5] The commitment by the clearing banks in banking month t relates to the level of their eligible liabilities on the make-up day in banking month $t-1$. There is no requirement that the ratio be maintained strictly on a day-to-day basis; daily deviations from the 1½% ratio can be averaged over the banking month and shortfalls or excesses carried forward.

14 More formally and at its simplest, we can write

$$M \equiv C+D \qquad (1)$$

where:

M = the stock of money
C = notes and coin in circulation with the non-bank private sector
D = the deposit liabilities of the banks

and

$$H \equiv R + C \qquad (2)$$

where:

H = the high-powered money base
R = the banks' reserves (say, vault cash plus balances at the Bank of England).

Both (1) and (2) are identities, not behavioural equations, and by simple manipulation they can be made to yield a third identity.

$$M \equiv H \left[\frac{1+\frac{C}{D}}{\frac{R}{D}+\frac{C}{D}}\right] \qquad (3)$$

15 In other words, *if* the authorities act so as to fix H [1] at some predetermined level, *if* the ratio of currency to deposits is constant and *if* the ratio of banks' reserves to deposits is constant, then the size of M is determined by H. For example, let us assume that:

(a) all banks always maintain 4% of deposits as vault cash to meet immediate operating needs and 1½% in balances at the Bank of England;

(b) this 5½% of deposits constitutes the monetary base and that the banks begin with no excess reserves;

(c) notes and coin in circulation with the public always amount to 15% of deposits; and

(d) the balance sheets of the Exchange Equalisation Account (EEA) and the overseas sector have been omitted and those of the Issue and Banking Departments of the Bank of England consolidated.

16 Let us suppose then that, in a given period, the public sector is a net recipient of one unit from the non-bank private sector (because, say, tax receipts have exceeded government disbursements). The resulting changes in the equilibrium positions of the Bank of England, the banking system and the non-bank private sector are shown in the two halves of the table below.

17 Before the change, the base stood at 5.5 (vault cash 4, bankers' balances 1.5), permitting banks to take deposits of 100. In the final equilibrium position, the base stands at 5.13 (vault cash 3.73, bankers' balances 1.4), again exactly 5.5% of total deposits (93.3). The payment of 1 by the non-bank private sector has actually been accomplished by a fall of 0.9 in the notes they hold, plus a 0.1 reduction in bankers' balances at the Bank; the corresponding gain of course accrues to the public sector, whose deposits at the Bank rise from 5 to 6.

18 For the banking system, however, the process has been altogether more significant, because the decline of 0.37 in the base has necessitated a multiple contraction of deposits of 6.7 (i.e. 0.37 × 100/5.5). Nothing so far in this article has, however, shown how this contraction occurs, and this major question is considered in the next section.

19 The presentation of the determination of the money stock in this fashion has a distinguished academic pedigree, which includes contributions from Phillips, Keynes and Meade.[2] As we have seen, the authorities have not, however, attempted to control H or R. Nor is it the case that the ratio of currency in circulation to deposits necessarily stays constant over time. Obviously this ratio may be affected by technological change (for example the development of credit cards), but also, from a theoretical point of view, there is no obvious reason why the ratio of currency to bank deposits should stay constant over time, at least when the latter are defined broadly to include both transactions *and* savings balances. Finally, there is no reason under the present arrangements why banks'

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Public sector deposits at Bank of England	5.0		Vault cash		4.0			
			Liquid assets and advances		104.5			
	25.5	25.5		110.0	110.0		125.0	125.0
Position after the change								
Bankers' balances	1.4		Deposits of non-bank private sector	93.3	1.41	Deposits with banking sector		93.0
Vault cash in commercial banks	3.73		Capital of banks	10.00	3.73	Equity holdings in banks		10.0
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Public sector deposits at Bank of England	6.0		Vault cash					
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[1] Earlier, in paragraph 7, it was argued that the authorities should take as their monetary base all or some of the reserves available to the banking system, i.e. R, rather than the total of high-powered money which also includes currency in the hands of the non-bank public, C. The above identity, of course, holds irrespective of how the authorities operate, but focus on the banks' reserve base, R, would reduce the effect on the money stock of fluctuations in the non-bank public's desired cash holdings (the C/D ratio in the above identity).

[2] C. A. Phillips, *Bank Credit*, (New York: Macmillan, 1920); J. M. Keynes, *A treatise on money* (London: Macmillan, 1930); J. E. Meade, 'The Amount of Money and the Banking System', *The Economic Journal*, vol. XLIV (1934), pages 77–83.

reserves of cash and bankers' balances should show a stable relation to any particular monetary aggregate. Only the clearing banks maintain the 1½% ratio, and even that requirement is over a period of time rather than for any particular day and is related to eligible liabilities rather than directly to deposits as recorded in the monetary aggregates.

20 It follows, not surprisingly, that, given present arrangements, there is no close relationship in the United Kingdom between changes in the monetary base and those in any other monetary aggregate. Indeed, to the extent that there has been any causal relationship, it could reasonably be argued that it has run *from* money to the base, rather than the other way round, a causality exemplified by the fact that the 1½% ratio relates to the previous month's eligible liabilities and that the authorities have always chosen to provide, at a price, the base money required. Nor has there been any close relationship between movements in the base and in nominal incomes. Indeed with high-powered money (H) largely consisting of currency in the hands of the public (C), and the latter being demand-determined, (according to our econometric estimates largely in response to current and past changes in consumers' expenditure) the direction of causation runs clearly from nominal income to notes and coin in circulation (C) and high-powered money (H).

21 The relevant question, however, is what would happen if present attitudes and institutional features were changed and the authorities sought to use the base rather than interest rates as a means of controlling the rate of growth of the monetary aggregates. Unfortunately, as noted in the introduction, the answer is related to the form, in particular the time horizon, of the monetary base régime in question. Further complications are added by the existence of a number of other issues that are not of major theoretical relevance in their own right but which represent awkward technical problems to be tackled before at least some forms of base control could be considered in practice.

A strict control of money

22 First we examine the implications of seeking to control the money stock strictly on a short-term basis. Even if it were universally accepted that strict short-term control of the monetary aggregates was undesirable, if not impractical, it would still be useful to consider the implications of strict control as an expositional device in order to clarify the issues. Moreover, there are a number of proponents of strict short-term control of the monetary aggregates, and of these some advocate the use of monetary base control to achieve this end. Of course it is possible to envisage ways in which banks' deposit liabilities might be subject to strict short-term control other than through regulation of the base. Bank deposits could be forced to grow at a pre-determined rate by government fiat, or by the imposition of some form of permanent supplementary special deposits scheme, with penalties on those banks whose deposit liabilities grew too slowly as well as on those whose liabilities grew too fast.

23 Returning to control via the monetary base, the most extreme form of regulation imaginable is one where the operations of the central bank were such as to predetermine the monetary base (for some of the problems involved see paragraphs 37–42) and where the banks were required to achieve their reserve ratio requirement exactly on a daily basis. If short-term control of the monetary base were to be translated into equivalent short-term control of the monetary aggregates, the ability of the banks to vary their actual (free) reserve holdings relative to their required level would have to be limited, for example by penalties applying to both excess and deficient reserves. Examination rapidly suggests that the idea of such tight management is impracticable but, as it throws up a number of points of general relevance to any attempt to control the base over any period, the arguments are worth considering.

24 The most appropriate starting point is perhaps the mechanism by which banks are supposed to adjust to, say, a shortfall of reserves (i.e. the base provided does not permit them to meet their reserve requirements on their existing level of deposits). When considered at all, the mechanism is usually held to be that the banks cut back on lending or sell off marketable assets. However, while this may improve the relative position of one bank, such action only eases the reserve position of the banking system as a whole fractionally, with that fraction depending on the required reserve ratio. Thus *unless the authorities relent and choose to provide more base money,* the only ways that the banks as a whole can overcome their reserve asset shortage are:

(a) to reduce their assets and liabilities by a multiple of the initial shortage of base money;

(b) to attract notes and coin from the public (which would be difficult to do, unless banks were to offer a variable premium for currency, thereby breaking convertibility between currency and deposits); or

(c) if there were lower reserve requirements on time than on sight deposits (as in the United States), to induce customers—by adjusting relative yields—to switch funds from sight to time deposits.

25 To illustrate this essential point, suppose that a bank sells off its Treasury bill holdings. Its balances with the Bank of England will rise, i.e. it will receive more reserve assets; the banks of those who buy the bills will lose an equal amount.[1] Only if the Bank of England steps into the market to buy the bills will the base be increased.

26 A similar conclusion follows with regard to the effect of foreign exchange transactions on the monetary base. As the banks try to improve their individual

[1] Provided the non-bank private sector does not purchase Treasury bills with notes and coin, the bank will receive net claims on other banks; its balances at the Bank of England will thus rise and those of other banks fall correspondingly.

position by selling assets, they will force up interest rates. Other things being equal, this will increase the demand for sterling by foreigners who now wish to obtain sterling assets, the rate of interest on which has become more attractive. However, the stock of monetary base will remain unaffected and under the control of the authorities if either the exchange rate is allowed to appreciate freely, or, if this is unacceptable, the inflow of capital is sterilised. A rise in the exchange rate might be forestalled without increasing the monetary base if, when the authorities purchase foreign currencies with sterling and accumulate international reserves in the EEA, they then finance these purchases by the sale of Treasury bills or some other debt instrument which is not included in the definition of the monetary base. Nevertheless, the sale of these debt instruments may raise interest rates further and also maintain monetary tightness, thereby attracting continuing inflows from abroad. This could lead to an unstable situation with persistently rising reserves together with rising domestic interest rates.

27 The same conclusion follows if the banks make what is now the more likely response to reserve pressure of bidding for funds (so-called liability management) by, for example, issuing certificates of deposit. Again, the effect will be to push up interest rates without increasing the base [except in so far as (b) or (c) in paragraph 24 apply]. But, this time, there could be an additional difficulty if the authorities have a broad money aggregate in mind as an intermediate target, in that liability management can have a perverse effect on the adjustment process of the banking system as a whole, since it tends to raise the yield offered on bank deposits relative to the yields on other liquid assets. This could accelerate the interest-rate spiral likely to develop as banks come under reserve pressure and, if rates of interest on bank lending do not keep pace with the rise in market interest rates, actually increase the demand for credit by making it attractive to borrow funds to on-lend in the wholesale money markets.

28 These problems might be mitigated if the reserve requirements on time deposits were lower than those on sight deposits. Then, as interest rates rose—increasing the opportunity cost of holding sight deposits[1]—holders would, over a period of time, switch their funds from sight to time accounts, progressively reducing the banks' overall need for reserves. However, the authorities would presumably only seek to control the monetary aggregates with a differential reserve requirement, in which sight deposits were given a higher weighting than time deposits, if they attached greater importance to the rate of growth of sight deposits than to that of time deposits. In the extreme case where the authorities attached no weight to the rate of growth of time deposits, they could set an M_1 target and only impose reserve requirements on sight deposits. Nevertheless, even with an M_1 target, the speed of adjustment of the non-bank private sector's asset portfolio in response to changes in the differential between sight and time deposit rates might not be fast enough for the banks to be able to meet their reserve requirements at all quickly. As a result, an interest-rate spiral might still emerge.

29 The conclusion of this line of argument is that strict control of the base (which would, of course, imply an end to all the present lender of last resort facilities) would continually threaten frequent and potentially massive movements in interest rates, if not complete instability. Changes in the base would inevitably carry implications for interest rates, and the greater the emphasis on control of the base the less the possibility that the central bank could intervene to ameliorate any interest-rate fluctuations. In the strictest form of control (the day-to-day regulation noted earlier), the problem would, of course, be at its most acute as no adjustment time (e.g. for the banks to curtail their loans to the non-bank public) would be available. Indeed it is highly dubious whether such a system could possibly work, mainly because of the time it would take for markets to adjust to the interest-rate changes induced by the banks in their attempts to meet their reserve requirements. But even for control over longer periods of time, strict control of the base would throw onto financial markets the whole burden of adjustment at present 'shared' by the Bank of England's lender of last resort facilities, its open-market operations, its foreign exchange intervention, and the permitted short-term variability in the level of balances held by the clearing banks at the Bank of England.

Structural adjustments in response to strict control

30 In extreme form, then, base control could imply enormous potential pressure on financial markets. It is a moot point as to how far they would develop to meet the burden. Other reactions would also be likely.[2] We now explore some of these on the assumption that the transitional problems of adjusting to the new system had been overcome.

31 One development might well be the sharp curtailment or disappearance of the overdraft system, indeed the curtailment or disappearance of any exposure, whether by formal or informal commitment, to an obligation to extend loans at some future time. At present, banks extend facilities to customers that in aggregate are roughly only half-used at any time. This is an element of flexibility provided by the banking system which most observers would regard as highly desirable. Even under the present supplementary special deposits scheme, the existence of these facilities may be an embarrassment to a bank, particularly as most empirical work on the demand for bank credit in the United Kingdom suggests that a bank's major defence in such circumstances—to raise the cost of borrowing—may not have a large (and certainly does not have a rapid) effect

[1] This assumes that the implicit or explicit return on sight deposits is either constant or at least not quickly responsive to changes in market interest rates.

[2] They would indeed follow from *any* short-term strict control over the money stock.

on the demand for credit.[1] It follows that the stricter the control of money (whatever the form of that control) the more risky it would be for banks to provide overdraft facilities in their present form.

32 A related development likely to occur would be that the banks would come to hold a larger proportion of their portfolio in easily-saleable assets, or, in so far as this was allowed, in excess reserves, correspondingly reducing relatively illiquid lending to the private sector. Similarly the non-bank private sector, being less able to obtain bank facilities, might also seek to hold larger amounts of liquid assets.

33 Such conclusions follow from the fact that the more tightly controlled the banking system the greater the short-term risk of illiquidity for all concerned. In the longer term, when such a system was fully established, it would seem to exhibit a certain inefficiency—with more risk than strictly necessary, balanced by larger liquidity holdings—but otherwise it could conceivably be workable. Such an approach would, however, appear to carry a higher risk of disturbances to the banking system reminiscent in some respects of those in the United Kingdom in the nineteenth century and in the United States before the establishment of the Federal Reserve System. Even under a monetary base control régime, the Bank of England would have to retain the right to use lender of last resort facilities to forestall a banking crisis, and assistance might have to be extended to individual banks more frequently than in the past. In the short run, any sudden change to the new system, with a possibly large but unpredictable increase in the demand for liquid assets in response to the increased risk perceived, would make assessment and management of the overall economic situation more difficult.

34 A third likely development would be the growth of holders of liquid assets not subject to cash ratio requirements, who would arbitrage between short-term liquid assets (such as Treasury bills) and bank deposits,[2] thereby reducing the extent of interest-rate fluctuation. Similarly, the banks might be able, at times of their own choosing, to rearrange some of their on-balance-sheet advances as off-balance-sheet acceptances, so that although they would resell some of their holdings of commercial bills to the non-bank private sector, they would guarantee the ultimate holders of these commercial bills against default by the original issuers. The rapid increase in acceptances almost immediately after the reimposition of the supplementary special deposits scheme in June 1978 suggests that the banks are able to rearrange their portfolios to some extent in this way.

35 Equally, however, such structural developments, resulting in an expansion of near-money liquid assets and an increased elasticity of response in velocity to changes in interest rates, would reduce the significance of a tight control over the money stock and also the monetary base. The financial system evolves continuously to meet the needs of the economy and will, in time, find ways round artificial road blocks.

36 All these developments would be likely to follow from any strict form of base control, though the 'adjustment problem' in each case would be worse, and the speed of the developments faster, the shorter the time horizon over which control was attempted.

Some technical and operational changes required

37 As noted in paragraph 23, day-to-day control of the base is very difficult to envisage. Under present institutional arrangements, there are unforeseen swings into and out of central government balances of up to several hundred million pounds a day, and the first requirement for day-to-day control would be either that the Government moved its business to the commercial banks or that the banking system moved to a next day settlement basis for all transactions. The logic of the first change is that unexpected flows—say from the non-bank private sector to the Government—would then leave bankers' balances at the Bank of England unaffected; at present, as noted earlier, the result of such flows is to alter these balances. The logic of the second change, which in administrative terms at least would constitute a retrograde step, is that the authorities would then have one day's notice of unexpected movements of funds.

38 Even then, however, the authorities would not have any advance warning of shifts in the public's demand for currency, which even on a daily basis can be large. The Bank of England already forecasts the demand for currency on a daily basis, as part of its projection of key factors affecting money markets, and, on occasion, errors here have been of the order of £100 million and are frequently £25-30 million.

39 Further, whatever the length of period over which control of the base is desired, the authorities' predetermined path would have to be set in non-seasonally-adjusted form. As presumably their objective would be to obtain a smooth seasonally-adjusted growth in the base or in some monetary aggregate, they would need to work from a seasonally-adjusted to an unadjusted projection of the base. Given the complexities and uncertainties of the seasonal-adjustment process for financial series, such a procedure could be sensible for, say, quarterly projections, but daily forecasts on such a basis would be subject to very large margins of error. Any attempt to control the banking system strictly on a very short-term basis would, therefore, result in unintended gyrations in the level of deposits.

40 A final difficulty with any form of very short-term control arises out of the question of the appropriate accounting basis for the banks. A lagged accounting

[1] Peter Spencer and Colin Mowl, 'The Model of the Domestic Monetary System' part one of *A Financial Sector for the Treasury Model* [Government Economic Service, Working Paper No. 17 (Treasury Working Paper No. 8), December 1978.]

[2] One requirement for such arbitrage to occur is that liability management of the kind described in paragraph 27 did not prevent Treasury bill yields from rising faster in response to reserve asset pressure than the deposit rates offered by banks.

basis is used for the purpose of calculating required reserves in virtually all countries, and is indeed suitable when the purpose of the reserve ratios is to provide a fulcrum for money-market operations to control interest rates. Virtually by definition, however, when the total of required reserves is related to the past level of deposits and where there are no excess reserves at the outset in the system, changes in deposits must cause the authorities to allow changes in bank reserves, and not vice versa, so that monetary base movements can hardly either control, cause or even indicate future movements in bank deposits.

41 One possibility would be to move on to a current accounting basis, with required reserves related to current liabilities. Even in this case, delays in obtaining current information on movements in liabilities (and, depending on the form of the required reserve base, delays also in information on movements of vault cash held at branches), would tend to mean that the banks would simply not be in a position to know what adjustments would be necessary during the course of the day to try to meet their required ratios.

42 It would be more in the spirit of monetary base control, though we do not know of any case where this has been applied, for the reserve ratio to be put on a lead accounting basis, that is to say that the liabilities of a bank at some future time, $t + n$, should be related through a required ratio to its current reserve base at time t. The strictness of the monetary base control régime would then relate to the adjustment time allowed, the averaging procedures adopted and the penalties imposed for non-compliance.

More relaxed versions of monetary base control

43 A number of the operational changes described above could be avoided and the problems of adjustment substantially mitigated with a more relaxed form of base control. Thus, the authorities could perhaps have a desired level for the base over, say, a six-month period but not insist that the base average out exactly at that level and not withdraw the lender of last resort and other facilities which at present avoid sharp short-term instability in financial markets.

44 Indeed at the limit, i.e. with no penalties for failing to meet a particular ratio, in effect with no *required* reserve ratio at all, movements in the monetary base could be regarded primarily as another monetary aggregate, possibly a leading indicator, movements in which could convey information on future developments. (Under present institutional arrangements, as explained earlier, the monetary base in the United Kingdom does *not* act as a useful leading indicator.) However, even with a long run of data, the monetary base series might not come to be a satisfactory leading indicator. Banks might wish to hold additional excess reserves, perhaps as a counterpart to a decline in the demand for bank credit, or an increase in their demand for liquidity. Accordingly, the rate of growth of banks' reserve holdings might not provide a good index of how expansionary the monetary stance was at the time. It has been argued, not least by monetarists, that the attention paid, for example, in the late 1930s by the Federal Reserve Board in the United States to the banking system's excess reserves was misdirected.

45 If the nature of the monetary base series were changed, say with banks required to hold a uniform reserve ratio [1] and a current or lead accounting basis, then it is possible, subject to the comment above, that the series could come to convey more useful information. After such a structural change, however, it would be several years before enough experience, e.g. of seasonal fluctuations, was amassed to enable such movements to be interpreted adequately. Thus, under the changed system banks would most likely have a greater incentive to hold excess cash reserves, depending on the costs involved in holding such excess reserves as against the costs and risks to each bank of finding itself short of cash reserves. It would be some time before any regular pattern of behaviour would be established and discernible.

46 Moreover, the Bank already obtains weekly monetary data from a sample of banks. While this experience is revealing only too clearly the difficulties of interpreting movements in a new series, such weekly data may in time come to provide the authorities with prompt information on monetary developments. Only if the movements in the monetary base should provide a reliable *leading* indicator of monetary developments would the series help the authorities to assess developments.

47 In practice, the phrase 'monetary base control' is not tightly defined; it can range from an attempt to control certain monetary aggregates on a tight day-to-day basis through to a generalised concern with the series as a potentially useful leading indicator, possibly among others, of future monetary developments. Between these two polar positions exists a relatively unexplored territory of gradations from tighter to easier control.

48 The purpose of paragraphs 22–42 is to show that an attempt to use monetary base control rigorously over short periods would be neither desirable nor feasible. The same objections do not hold, at least not to anything like the same extent, to proposals for considerably more relaxed versions of this approach, in which proper and sufficient adjustment time is given to the banking system. Indeed, because it is the rôle of the banking system to absorb and to meet shocks occurring in the demand or supply of money and credit within the economy, the search for tight short-term control of the money stock, for example on a week-by-week basis, would seem to be misguided. This is *not*, however, to

[1] As already noted in footnote [1] on page 150, the fact that banks do differing kinds of business and have differing balance-sheet structures makes any approach to 'uniformity' rather difficult in practice.

deny the possibility of improving control techniques for influencing monetary developments over a longer horizon measured, say, in terms of four to six months.

49 In this respect there are perhaps two main ways in which the adoption of a 'relaxed' monetary base system, which did *not* aim to force the banking system into unduly rapid adjustment by imposing penalties on short-term divergences from a required ratio (for example such relaxation could be obtained by some combination of generous averaging procedures, gentle initial penalties or even an absence of a *required* cash ratio) might improve the authorities' control over the system. *First,* if movements in the monetary base did prove to be an informative leading indicator of future developments, it would provide the authorities with information with which to respond more quickly and firmly to diverging monetary trends than they are now able to do. The experience of Switzerland indicates that this may be the case.[1] Indeed, with such a monetary base approach—assuming that it did prove to be a reliable leading indicator—there would perhaps be some presumption that firmer action might be taken more quickly, as the authorities reacted to movements in the monetary base. Nevertheless, against such putative longer-term benefits would have to be set the costs of structural changes involving disturbances and dislocations to well-established arrangements. Moreover, for several years while the system was adjusting to the structural change, it would be virtually impossible for the authorities to glean any worthwhile information from the new series. Furthermore it must be emphasised that the use of the monetary base as an adjunct for improving control over monetary developments is *not* an alternative to varying interest rates for that purpose, but indeed a means of trying to ensure that interest rates vary sufficiently quickly and widely to achieve such greater control.

50 The *second* possible source of benefit from the adoption of monetary base control might occur if such a system entailed or encouraged a change in the structure of financial markets which allowed the authorities to control the volume of debt sales to the non-bank public more closely and effectively; for control of the broad monetary aggregates e.g. sterling M_3, whether with monetary base control or not, must involve sales of sufficient debt by the authorities to offset other factors (for example, the budget deficit) tending to augment monetary growth. Indeed, some proponents of monetary base may see the main advantage of a move in this direction, not in any way as providing any mechanical or 'multiplier' method of monetary control, but rather as a means of forcing or stimulating the growth and development of debt markets, particularly short-term debt markets, in a way that might give the authorities greater control over the total debt sold to the non-bank public in any period. This would, however, be a very round-about way of trying to achieve changes in the structure and nature of such markets, for such changes do not logically require the adoption of a move to monetary base control and could be considered directly on their own merits; some aspects of this latter subject are further discussed in the article on the gilt-edged market on page 137.

51 To summarise: the critics of the authorities' present approach to monetary management often contrast this with what might be obtained if the authorities were instead to adopt monetary base control. One purpose of this article is to show that there are several variants of monetary base control (an imprecise term) and to indicate reasons why *rigid* monetary base control would be unacceptable. More relaxed versions of such a control system might be accompanied by changes in the functioning of certain debt markets, though any such changes should perhaps be considered on their own merits quite separately, and might provide the authorities with additional information to allow prompter and firmer countervailing action. Any such putative benefits would, however, have to be weighed against the costs of making major structural changes in the system.

[1] See page 158.

Appendix

Practice of other central banks[1]

52 This appendix describes the monetary reserve requirements imposed on the banking system in a number of other countries, and the ways in which the central banks of these countries use the ratios for purposes of monetary management. Of the countries considered, two—Western Germany and the United States—are included because of their general economic importance and because the West German central bank's target for central bank money is sometimes misinterpreted as a form of monetary base control; of the rest, Italy, Switzerland and Spain are included because their central banks have used a monetary base target as an adjunct in controlling the monetary aggregates, rather than using reserve ratios as a fulcrum on which to set interest rates.

United States

53 Federal Reserve member banks are required to hold non-interest-bearing balances with a Federal Reserve bank in the following proportions to their deposit liabilities:

Net demand deposits	
Under $2 million	7%
$2 million – $10 million	9½%
$10 million – $100 million	11¾%
$100 million – $400 million	12¾%
$400 million or more	16¼%
Saving deposits	3%
Time deposits	
Under $5 million, maturing in:	
30–179 days	3%
180 days–4 years	2½%
4 years or more	1%
$5 million or more, maturing in:	
30–179 days	6%
180 days–4 years	2½%
4 years or more	1%

Since 2nd November 1978, a supplementary reserve requirement of 2% has been imposed on time deposits of $100,000 or more, on obligations of affiliates and on ineligible acceptances.

54 The figure for deposit liabilities used to calculate each bank's reserve requirement is the daily average of deposit liabilities over the reserve computation week running from Thursday to Wednesday. The banks are then required to hold the appropriate proportions of these deposit liabilities in the form of average vault cash held in the same week and/or bankers' balances at the Federal Reserve in the settlement week which occurs two weeks later. The banks can average their daily holdings of bankers' balances over the settlement week. The banks' daily average can fluctuate within a +/− 2% per day interval of their average daily reserve requirement for the settlement week. Allowable surpluses or deficits have to be carried over into the next settlement week. Unallowable surpluses outside the +/− 2% interval cannot be carried forward, and unallowable deficits incur penalties imposed by the district Federal Reserve bank.

55 Since March 1979, the Federal Reserve Board (FRB) has published a high-powered money stock series consisting of notes and coin in circulation with the non-bank private sector, vault cash of the FRB and non-FRB member banks, required reserves of FRB member banks and the excess balances of FRB member banks. Since August 1968, the Federal Reserve Bank of St Louis has published a somewhat different high-powered money series in which the required reserves component is adjusted to take account of official changes to the reserve ratios and certain other shifts in required reserves.

56 However, the rates of growth of the monetary aggregates are not controlled by regulating the rate of growth of the monetary base or the stock of high-powered money. Interest rates are used as the main short-run tactical instrument for controlling the rate of growth of the monetary aggregates, and, to the extent that the authorities set interest rates at any predetermined level for some interval of time, they have to relinquish control for that period of time over the rate of growth of the monetary base. Each month, the Open Market Committee sets the Open Market Manager a target range for the Federal Funds rate (overnight inter-bank rate). The Open Market Manager then undertakes open-market operations in the inter-bank market, including the use of sale and repurchase agreements ('repos'), in order to keep interest rates within that range at a level that is influenced by incoming information on the behaviour of the monetary aggregates relative to short-run 'tolerance ranges' set with respect to the short-run growth rates of these aggregates. Sustained changes in the level of the inter-bank rate have a ripple effect on longer rates and hence on the banks' deposit liabilities and the stock of high-powered money.

57 The Federal Reserve also provides discount window lending to the banks, which tends to dampen short-term fluctuations in the Federal Funds rate. Borrowing through the discount window is cheaper than from the money market (in April 1979 discount window lending was generally about ½% below the inter-bank rate), but administrative guidelines are designed to restrict the supply of these funds to what is sufficient to offset seasonal and other temporary fluctuations in banking liquidity. However, the administrative guidelines do not prevent the authorities from providing almost unlimited funds in order to forestall disturbances in the banking system after major insolvencies, such as the Franklin National Bank and the Penn Central Railway Company bankruptcies.

58 To the extent that the authorities provide funds through the discount window and support to the markets through open-market operations and since the reserve requirements of the banks are calculated on a lagged accounting basis, changes in the stock of money tend to cause changes in the monetary base two weeks later. Thus, in the short-run context at least, changes in the base generally tend to lag rather than lead changes in the money supply.

Canada

59 The Canadian arrangements for controlling the money supply are broadly similar to those used in the United States, and therefore the institutional details have been omitted. The Bank of Canada uses interest rates as an instrument to control the rate of growth of M_1. This aggregate has a relatively high interest-elasticity, and therefore only relatively small interest-rate changes are required to retard or accelerate its rate of growth. Interest-rate changes only affect the rate of growth of M_1 with a lag, but the Bank of Canada does not attempt to exercise strict short-term control over M_1. Deviations of M_1 from its desired path which do not persist for more than a few months do not appear to have any significant effects on nominal incomes, and therefore it appears unnecessary and even undesirable to the authorities to attempt to offset these short-term fluctuations.

Western Germany

60 Minimum reserve ratios are fixed by the Bundesbank in accordance with monetary policy requirements. At present the banks are required to keep on average about 13% of their sight deposits, 9½% of their time deposits and 6½% of their saving deposits as bankers' balances or vault cash. (Vault cash has been included as a reserve asset since 1978.) The reserve requirements of the banks are calculated on a lagged accounting basis: the average of banks' deposit liabilities mid-month to mid-month determines the daily average of bankers' balances required over the calendar month starting two weeks after the beginning of the mid-month period.

[1] We appreciate the co-operation of other central banks in the preparation of this appendix.

61 Since 1974, the Bundesbank has announced a target rate of growth for the stock of central bank money (CBM), which consists of the banks' reserve requirements at constant reserve ratios (16.6% for sight deposits, 12.4% for time deposits and 8.1% for saving deposits), [1] and notes and coin in circulation with the non-bank sector. Thus CBM largely reflects M_3, which is defined as currency in circulation, sight deposits, time deposits and funds borrowed for less than four years, and saving deposits at statutory notice. A certain disadvantage of CBM is, however, the large weight given to currency in circulation compared with bank liabilities. The Bundesbank takes this into account in analysing short-run developments in monetary aggregates.

62 Irrespective of the relative importance attached by the Bundesbank to each monetary aggregate, CBM is not seen as an instrument but as a monetary target variable. The Bundesbank controls money-market conditions (which indirectly affect the development of CBM) by using a number of instruments such as official bank lending rates (discount rate, Lombard rate), open-market operations, variations in reserve requirements and rediscount quotas.[2] By varying the terms on which it satisfies the demand for cash and bankers' balances, the Bundesbank gradually adjusts the stock of CBM drawn from it to the growth rate at which it is aiming.

63 The main precondition for an effective monetary policy is seen as being that the central bank is not forced to take action but is master of its own decisions, i.e. does not have to create central bank balances of banks on a large scale against its will, either because of intervention obligations in the exchange or securities markets or because of the automatic financing of budget deficits. Since the spring of 1973, when the Bundesbank was released from its obligation to intervene in support of the US dollar, this precondition has generally been met in Western Germany.

Switzerland

64 At present no formal reserve requirement is imposed on the banks for control purposes. The banks are required to meet a cash ratio on the last day of each quarter, but on these days the Swiss National Bank (SNB) ensures that the banks have sufficient cash reserves. Thus, the relationship between the monetary base and M_1 depends on established portfolio behaviour and not on any imposed cash ratio.

65 The SNB's main target has been for M_1, but, initially, it also published a target for the rate of growth of the monetary base. Nevertheless, the monetary base target was intended to be consistent with the desired rate of growth of M_1, rather than a conceptually separate target. Subsequently it ceased to publish a separate target for monetary base, although it still regarded its movements as indicating the likely future movements of M_1.[3] The SNB's target rates of growth for M_1 and the outturns for each calendar year are given below:

Per cent

Calendar year	Target rate of growth for M_1	Outturn
1975	6	4.4
1976	6	7.7
1977	5	5.5
1978	5	17.3

The overshooting of the M_1 target by a wide margin in 1978 was not due to an operational error, but due to the SNB's decision to set a Swiss franc/deutschemark exchange rate target in the autumn of 1978. The adoption of an exchange rate target, coupled with the need for large-scale intervention in the foreign exchange market in order to prevent the Swiss franc from appreciating, resulted in a sharp rise in M_1 and the adjusted monetary base.

66 However, even in 1977 when the authorities were successful in adhering to their monetary target, the annualised monthly rates of change of M_1 ranged between 9.6% and 3.1%. In fact, the SNB did not attempt to control the rate of growth of M_1 on a month-to-month basis, nor could the SNB's control arrangements facilitate such short-term control. Short-term control of M_1 would have required tighter control over the monetary base/M_1 ratio, and strict short-term control of the supply of monetary base. In practice, the rate of growth of the monetary base fluctuated more than the rate of growth of M_1 (in 1977 the month-to-month growth rates of the adjusted monetary base ranged between –4.5% and 6.3%). Sharp, transitory fluctuations in the monetary base tended not to affect M_1, precisely because banks allowed their monetary base/deposit liability ratios to fluctuate so as to offset these fluctuations.

Spain

67 Since 1973, monetary policy has been geared to controlling the rate of growth of M_3, which is defined as non-bank private holdings of notes and coin plus sight, saving and time deposits with commercial, industrial and saving banks. The authorities respond passively to changes in the demand for notes and coin and therefore:

(a) no attempt is made to target and control the stock of high-powered money; and

(b) the control of M_3 is achieved through the control of bank deposits (about 90% of M_3).

68 Banks are required to hold 'eligible cash assets' (coin, notes and non-interest-bearing deposits with the Bank of Spain) as a proportion of those deposit liabilities which are included in the definition of M_3. At present, the cash requirement is a single figure (5.75%) common to all types of banks and to all kinds of deposits. The required reserve is calculated on the basis of daily averages over ten-day periods, with only a two-day lag between assets and liabilities (e.g. liabilities of days one to ten have to be matched with assets of days three to thirteen). On a daily basis, cash assets are not allowed to be lower than the cash ratio minus 1 percentage point (4.75% at present), and excess reserves exceeding 1 percentage point of deposits (over 6.75% of deposits at present) are not counted in the ten-day averages. Average excess reserves of the banking system fluctuate around a level of 0.10% of deposit liabilities.

69 The growth of bank deposits is controlled by changes in the ratio requirement—though less and less frequent use is made of this instrument for short-run adjustments—and through the control of the ten-day average supply of 'eligible cash assets' by the Bank of Spain (based on daily information on bank deposit balances with the Bank of Spain and forecasts of the banks' notes and coin holdings). The control of 'eligible cash assets' is achieved by a systematic compensation for those items in the Bank of Spain's balance sheet which the Bank cannot control in the short run (non-bank holdings of notes and coin, foreign assets, and loans to the public sector) through a daily regulation of its operations with the banks, which have been always heavily indebted to the central bank. Besides occasional changes in some rather stable lending facilities (e.g. quotas for three-month rediscount), such a regulation relies mainly on the volume of one-day loans which are distributed through daily auctions. Occasionally, the Bank of Spain has absorbed liquidity by selling short-term paper (special Treasury bills) to banks, and very recently, in order to compensate for a massive inflow of foreign exchange, interest-bearing special deposits have been required (they amount now to 3% of bank deposit liabilities as of 31st December 1978, have no definite term and are remunerated at the Bank of Spain discount rate, which is a nominal rate below market rates).

70 Due to inflation, to the legal control on short-term bank interest rates and to the lack of developed competitive markets for long and short-term financial instruments, no great value can be attached to the evolution of interest rates, which in any case are not a target of monetary policy and cannot be relied upon as the main transmission mechanism between bank cash assets and deposits. However, the self-regulation by banks of the growth of their portfolio of loans to the private sector in response to their liquidity position provides for such a transmission. A developed market for one-day to three-month inter-bank loans, with quite volatile interest rates, exists and is an important means of adjustment for individual banks, though not for the system as a whole. Though interest rates are not a target for monetary policy, extreme movements of inter-bank rates have usually prompted temporary adjustments in the supply of cash assets by the Bank of Spain. In fact, the authorities do not attempt to control bank deposits and M_3 on a month-to-month basis as they are aware of variable lags in the response of the banking system to changes in the supply of cash assets. A three-month moving average of M_3 has been

[1] These ratios were the actual reserve ratios in force in January 1974.

[2] See H. Bockelmann 'Quantitative targets for monetary policy in Germany'. *Cahiers Economiques et Monétaires No. 6.* (Banque de France, 1977), pages 11–24.

[3] Schiltknecht of the SNB, in his paper 'Targeting the base—the Swiss experience' presented at the Conference on Monetary Targets, at the City University, May 1979, has argued that a generalised Box-Jenkins transfer function can be used to predict the rate of growth of M_1 from past changes in the monetary base/M_1 ratio and the monetary base stock. The transfer function seriously overpredicted the rate of growth of M_1 during the Chiasso crisis, but otherwise its forecasting performance has been satisfactory.

a standard reference for monetary policy analysis and decisions, but recently more emphasis is being placed on cumulative rates of growth over six-month periods.

Italy

71 The Banca d'Italia publicly announces annual targets for the rate of growth of the monetary base and other monetary aggregates, such as bank lending and total domestic credit. Each month, the central bank sets itself an unpublished target for the rate of growth of the monetary base, which is compatible with its publicly-known annual targets, but allowances can be made for seasonal and other temporary factors. The monetary base is defined as notes and coin in circulation with the non-bank private sector, cash in the vaults of the banks, bankers' balances at the central bank and unused credit lines at the central bank (the latter being a potential liability of the central bank). Postal deposits are also included in an enlarged definition of the monetary base. 15.75% of the increase in the banks' deposits over the month has to be held as bankers' balances, 5.5% interest being paid on these deposits, which is, however, well below market interest rates. There are no averaging or carry-over provisions: compulsory reserves are presently paid with a lag of fifteen days, a separate statement on reserve-bearing liabilities being sent in by the banks in advance of their main monthly statement.

72 The central bank seeks to control the rate of growth of the monetary base (and through this the monetary aggregates) mainly by undertaking day-to-day open-market operations in Treasury bills, in order to maintain a desired level of excess bank reserves. In addition, the authorities impose direct controls on bank lending in order to prevent increases in the demand for credit bringing the banking system under severe pressure. In recent years it would seem that the authorities have placed most weight on these direct controls in their attempt to constrain the rate of monetary growth. In so far as the authorities' prime objective in their open-market operations is to control the rate of growth of the monetary base, they cannot also set the level of Treasury bill or inter-bank rates. However, during 1978, when there was a large Treasury deficit and sizable inflows from abroad, the central bank did not attempt to sterilise fully the creation of monetary base. The rate of growth of the monetary base was allowed to rise in order to avoid movements in interest rates which could have checked the recovery of industrial production.