

National money of account, with a second national money or local monies as means of payment: a way of finessing the zero interest rate bound.

Stephen Davies

RIEB, Kobe University

10 September 2004

Abstract

This paper shows how negative interest rates can be implemented—at much less cost than under alternative proposals—by separation of the unit of account and means of payment roles of money—i.e. by having these roles performed by different moneys. Such separation has been far from unusual in history, however unnatural it may seem to those whose experience is of modern non-separated monetary systems. One possibility discussed is that the means of payment role of cash could be provided by local currencies rather than a national currency.

JEL Classification B59, E21, E31, E42, E50, E52

Keywords negative interest rates, money of account, local currencies.

“If, other things remaining the same, the leading banks of the world were to lower their interest rate, say 1 per cent below its ordinary level, and keep it so for some years, then the prices of all commodities would rise and rise and rise without any limit whatever; on the contrary, if the leading banks were to raise their interest rate, say 1 per cent above its normal level, and keep it so for some years, then all prices would fall and fall and fall without any limit except Zero.”¹

“The government need not produce dollars in order to define the dollar, any more than it has to produce yardsticks in order to define the yard.”²

The motivation for this paper³ starts from the observation that, having reached a state

¹ Wicksell (1907)

² Hall (1999)

³ The proposal in this paper is essentially that put forward in an earlier paper: Davies (2002). However, much of that earlier paper was devoted to an inevitably over-simplified discussion of a range of alternative analyses of Japan’s “lost decade”, and this will have distracted some readers from the technical proposal it made. This new paper contains an account of historical precursors to and parallels with my suggestion, of which I was not fully aware when I wrote the earlier paper. I have also benefited from the comments of Professor Toshiki Jinushi of Kobe University on the presentation of the argument in

of technology in which an advanced country could, if necessary, conduct its business without using cash, Japan has allowed the continued existence of cash—through the zero lower bound on interest rates that cash as we know it apparently entails—to cause it to “lose a decade”.

We can certainly envisage a world entirely without cash; indeed many eminent monetary economists have, as a matter of relatively urgent practical relevance, been debating in recent years the nature of such a world and in particular whether the monetary authorities will be able to control a meaningful interest rate in such a world⁴. For many types of transactions, people in advanced economies can much of the time do perfectly well without cash already. In the UK, non-cash payments account for 58 per cent of retail payments by value and 25 per cent by volume in 2002: the volume share is forecast to rise to 38 per cent by 2009.⁵

Those who have most need of cash are drug-dealers and tax-evaders.⁶ (Also drug-users: a 1999 survey showed that 99 per cent of Bank of England notes were contaminated with cocaine, and most euro notes were also contaminated with cocaine within a few months of the introduction of euro notes and coin.) Yet, as discussed more fully later in this paper, governments everywhere continue to allow the existence of cash to exercise a constraint on national monetary policy, in the form of the zero bound on short-term interest rates.

Although a cashless economy is imaginable, cash certainly still has some advantages even in certain legitimate contexts, and it is not my intention here to advocate the abolition of cash. The purpose of this paper is to show how we can both have cash and at the same time remove the zero bound on interest rates.

The zero bound on interest rates is not just of theoretical interest. Various estimates of interest rate rules for Japan show that interest rates needed to be negative for substantial periods of time from the mid 1990s⁷. The Bank of Japan has held overnight interest rates close to zero from early 1999 up to the time of writing (August 2004). It is

an intermediate paper.

⁴ See, for example, Friedman (1999)

⁵ Source: Association for Payment Clearing Services (APACS): <http://www.apacs.org.uk/>

⁶ Humphrey et al. (2004) estimate that illegal use of cash and hoarding of cash accounted for 67 per cent of total demand for cash in Norway in 2000.

⁷ E.g. McCallum (2002), Okina and Shiratsuka (2001).

inconceivable that they would not have cut interest rates below zero for at least some of this time if they had thought this option open to them. As the quote above from Wicksell suggests, if the rate of interest is too high (e.g. zero when it should be negative) the economy may simply move further and further away from equilibrium. There is no presumption that the economy will be stable if interest rates themselves cannot adjust in the required direction (though, of course, the dynamics depend on the way expectations are formed).

The central point made in this paper that the zero bound on interest rates is actually quite easy to get round. All that is needed is to escape from the frame of mind that takes it as inevitable that the monetary unit of account is identical to the means of payment. That it need not be is the point of the quote from Robert Hall above.

Separation of the means of payment and unit of account in medieval Europe

Most of us so take for granted the identity of cash with the unit of account that some historical digression is helpful both to explain what is meant by separation of the means of payment and unit of account and to demonstrate that separation is perfectly feasible.

The monetary systems that prevailed for hundreds of years in much of continental Europe were based on the monetary units established by Charlemagne: pound, shilling and penny⁸. In these systems there certainly was material money in circulation: gold and silver coins, as well as token coins of lead; but these were not in the same denomination as the unit of account. As described by Kaye, “money of account functioned as an idealized monetary scale of artificially fixed ratios of named coins that were often no longer in circulation, against which the actual value of the coin in circulation was measured”.⁹

Spufford puts it thus: “In most parts of late medieval Europe...a dichotomy existed in the functions of money. On the one hand, money of account was the *measure of value*, whilst on the other, the actual coin was the *medium of exchange* and the *store of wealth*...”

Most financial transactions were first determined and expressed in money of account,

⁸ In French: livre, sou and denier. A pound was equal to twenty shillings; a shilling was equal to twelve pennies.

⁹ Kaye (1998), p.190.

although payments were naturally made subsequently in coin, or surprisingly often in other goods. Coin itself was valued as a commodity in terms of money of account, and, like any other commodity, its value frequently varied.”¹⁰

As Spufford’s reference to payment in other goods implies, a money of account does not necessarily entail the use of monetary payments. A monetary unit of account is convenient even in a barter economy, to summarise debts and assets in a “favour bank”. (So that someone can be said to owe 10 pounds, rather than 3 chickens plus one hammer plus two massage sessions, etc.)¹¹

In parts of continental Europe the separation of means of payment and unit of account continued well beyond the middle ages. Thus in France, for example, right up to the Revolution, coins in specie had a “price” in terms of the units of account, a price that was changed from time to time by royal decree. Announcing a five per cent increase in the price of specie (so that a particular gold coin would exchange in future, say, for one pound one shilling instead of for one pound) meant that the price (in pounds) of all commodities would rise sooner or later by around one twentieth, and would reduce the real value of debts (including, of course, royal debts) denominated in pounds. (This was the standard mechanism, rather than changing the fineness or weight of coins, by which French kings used the inflation tax to improve their finances.) Under this system inflation (measured in terms of the unit of account) is roughly the sum of any change in the price of specie relative to other prices (caused by discoveries of new mines, or exhaustion of old ones, say) and the change in the unit account price of specie.¹²

The fullest discussion of the history in Europe of this separation of the unit of account from money used in payment is in a classic paper by Einaudi (who uses the term “imaginary money” for money of account that has no cash form): ¹³

“Today each country has only one monetary unit: the lira, the franc, mark, pound sterling, or dollar. This is the system established by the French assemblies at the end of

¹⁰ Spufford (1986), p. xx

¹¹ Kocherlakota (1998) argues that “fiat money’s only technological role in an economy is to act as *societal memory*: money allows people to credibly record some aspects of their transactions and make that record accessible to other people”. Clearly money of account can fulfil this role, without need for fiat money in material form.

¹² A monetary reform of 1577, under which the ecu gold coin became the unit of account, was abandoned in 1602, when separation between the unit of account (the livre) and the means of payment was reinstated. See Sargent and Velde (2002), pp208-212.

¹³ Einaudi (1953).

the eighteenth century... Prior to the French Revolution, the monetary system of most European countries was based on altogether different principles....

In the time of Malestroit, a customer could pay a shopkeeper for an ell of velvet, priced at 10 pounds tournois by giving him 4 ecus de soleil rated at 2L 10s each. Similarly, the buyer of a barrel of wine, costing 12 pounds, could give in payment 20 testoons current at 12 sous per testoon. A shoemaker would be satisfied if he received 15 douzains in black money, at 12d. per douzain, for a pair of shoes selling at 15s.... If there was a change in the ratio between real and imaginary money...the number of coins to be paid in discharge of a debt would vary inversely.”

The “New Monetary Economics”

This account of historical experience has established the feasibility of the separation of unit of account and means of payment. In raising the possibility of separation, and also in questioning the essential role of cash, I am echoing some of the points made by the school of thought known as the “new monetary economics” (NME). The three essential ideas of this school are, according to the relevant entry¹⁴ in the New Palgrave:

- Monetary and monetary institutions derive their special status from regulations imposed by governments
- Different regulations would produce radically different financial and monetary arrangements
- **The function of money as the unit of account may be separated from the function of money as the means of payment** (my emphasis).

Although the NME school was only identified as such in the 1980s, some of their measures they advocated (including the separation of the unit of account from the means of payment) can be traced back to the writings of nineteenth century economists¹⁵. The school also tend to regard cash as non-essential: Fischer Black¹⁶ and Eugene Fama¹⁷, in two of the best-known contributions to the NME literature, both discussed the possibility of economies in which cash had ceased to exist.

The contribution to his literature of most interest to me, however, is that of Greenfield

¹⁴ Harper and Coleman (1992)

¹⁵ As shown by Cowen and Kroszner (1987)

¹⁶ Black (1970)

¹⁷ Fama (1980)

and Yeager. They specifically referred to the historical evidence of separation of unit of account and means of payment when, in an article published in 1983, they proposed a radical monetary reform under which the national monetary authorities would define a unit of account (in terms of a bundle of commodities) but would not issue any money.¹⁸ (Note that there is not merely an absence of cash in their proposal, there is an absence of bank reserves as well; there is no monetary base. This is crucial for the feasibility of anything like traditional banking in the world they describe.)

The authorities would **define** a pound, say, as equal to one apple plus one banana plus one cherry. But they would not issue any notes or coins corresponding to pounds, or multiples or fractions of pounds; indeed, they would not issue any notes and coins. They called this monetary system the “BFH” system, after Fischer Black, Eugene Fama and Robert Hall, who had all at that stage contributed to the NME literature.

This BFH system “would get rid of any distinct money existing in a definite quantity. The government would be forbidden to issue obligations fixed in value in the unit of account and especially suitable as media of exchange”. In the absence of money problems of monetary policy would disappear. “No longer, then, could there be too much of it, causing price inflation, or too little, causing depression, or a sequence of imbalances, causing stagflation. A wrong quantity of money could no longer cause problems because money would not exist.”

Greenfield and Yeager were at pains to distinguish their proposed system from a commodity standard in which money is issued and is convertible into a bundle of commodities (or a single commodity, typically gold) at a fixed ratio. In the BFH system, a pound would be **defined** as a bunch of commodities; but neither the central bank nor any other official body would have any obligation to buy or sell any commodities in exchange for pounds. They would thus not need to store commodities. The pound would have a relatively stable value and thus be an attractive unit of account, not because the authorities take any action to ensure its stability, but because the aggregate price of the bunch of commodities it represents—if broadly enough defined—is likely to be relatively stable in relation to the average price of other goods and services bought and sold in the economy.

¹⁸ Greenfield and Yeager (1983).

The two main criticisms of Greenfield and Yeager in subsequent literature related to the sustainability of the unit of account (which I discuss later) and to the nature of the means of payment in the BFH system. By assumption, there is in the system no outside money; no cash that is the liability of the government or central bank. This lack of outside money also means that banks cannot create inside money in the conventional way. In the world we are familiar with, banks normally come into being as a result of customers depositing outside money. The deposits are then a claim to receive back outside money in due course. Banks cannot develop in this way in the BFH system, because there is no outside money. Even in the absence of cash, if the central bank bought private sector securities by crediting bank accounts at the central bank, normal banking could develop on the base of these reserves. But as noted already, there are no reserves of this sort created by government; there is no monetary base at all.

Nevertheless, Greenfield and Yeager insist that transactions in their economy would not involve “*crude barter*” (their italics); money market funds offering payment services would develop. (They were writing at a time when in the US, regulation Q—the restriction on interest rates paid on bank current accounts—had led to the widespread availability of money market funds offering transaction services.)

One can think of mutual funds developing in the following way. A company might grant a mutual fund ownership of part of the firm, in return for which the company would receive shares in the mutual fund. The company would then use the shares in the mutual fund to remunerate its employees who would thereby become shareholders of the mutual fund. The mutual fund would offer transaction services that would enable shareholders to use their shares to purchase goods and services from other companies.

One problem with this arrangement is the risks to which the workers would be exposed through movements in share prices. A transactions medium is needed that is suitable for low net worth individuals (who might be spending the whole of their shareholding between regular salary transfers, and so would be severely affected by a fall in its value) as well as the more affluent (whose shareholding might largely represent saving rather than transaction balances).

A second problem is the need for settlement between different mutual funds (to offset net payments by one fund's share holders to another fund's shareholders). This settlement has apparently to be affected by a transfer of shares between funds: but that

means a constant change in the risks that a particular fund is exposed to as a result of changes in shareholdings in the course of settlement. The fund would seem to have to accept these risks passively with no chance of managing them, and possibly without the information to assess them¹⁹.

The background to Greenfield and Yeager's proposal was of course the high inflation of the 1970s and a belief (widely held at the time, but seemingly mistaken, given subsequent developments) that fiat money controlled by governments or central banks inevitably led to inflation. If we fast-forward to the late 1990s, we come to a literature that does not *advocate* a cashless system as a way of avoiding inflation; instead it contemplates the possibility that technical change in the private sector will make cash redundant, and discusses the consequences for monetary policy.

One strand of the recent literature is about whether cash is actually likely to become extinct, and the generally accepted answer is "probably not" (and not just because of the demand for cash for illegitimate activities)²⁰. Another strand is whether the monetary authorities would be able to maintain meaningful control of interest rates in the case that cash did become extinct: a question that is now, following Woodford's influential analysis, generally answered in the affirmative.

The feasibility of negative interest rates

How do monetary authorities control interest rates? The precise institutional details vary from country to country, but essentially they do so by forcing leading players in the money market to borrow from them at an interest rate of the authorities' own choosing. Woodford describes how, even in a cashless economy with no requirement on banks to hold reserves at the central bank, the central bank can nevertheless exert tight control on short-term money market interest rates through the interest rate it sets on deposits by and lending to its counter-parties. If banks can get, say, a return of 5 per cent on deposits with the central bank, then they will not lend out money for less than this on the interbank market. And if they can borrow overnight from the central bank at 5.5 per

¹⁹ Greenfield and Yeager see the replacement of banks by mutual funds as a significant advantage in its own right: it would create a financial system that was immune to the financial instability that can be caused by runs on banks. This is however really a separate issue. The replacement of banks by money market mutual funds has been advocated by others (e.g. Goodhart (1993)), but within an economy where cash circulates in the normal way.

²⁰ See e.g. Goodhart and Krueger (2001)

cent, they will not pay more than 5.5 per cent to borrow from the interbank market. Thus, with these interest rates set by the central bank, overnight interbank rates will not move outside a 5 to 5.5 per cent “channel”.²¹

Does the central bank’s ability to set interest rates extend to setting negative interest rates? While the central bank may set a negative interest rate on deposits from and lending to its counter-parties, if it wants that interest rate to feed into the rest of the economy it cannot supply on demand cash that does not depreciate in terms of the unit of account. Either it has to ration the cash it supplies, or it has to supply a form of cash that depreciates in terms of the unit of account (the unit used, for example, in the accounts of the commercial banks at the central bank), and that depreciates at a rate at least equal to the negative interest rate set on lending by the central bank. Providing one of these conditions on the supply of cash is met, variations in the central bank’s (negative) deposit and lending rates will feed automatically into interest rates throughout the economy.

Obviously if neither of these conditions is met, the central bank will not succeed in pushing negative interest rates throughout the economy. Banks will simply “round-trip”: they will use their borrowings from the central bank to invest in cash (provided the borrowing rate is sufficiently negative to cover security, insurance and storage costs). There is no reason why they would lend at negative interest rates when they could invest in cash at a zero interest rate (on the reasonable assumption that the risk of losses on any lending are at least as great as the cost of storing and insuring cash holdings). The central bank would face potentially unlimited losses on the round-tripping (an unbounded balance sheet, with negative interest rates on its assets and a zero interest rate on its main liability).

This source of a lower bound on interest rates is not one that needs to be or can be settled by empirical studies. The stability and shape of the money demand function at very low positive interest rates is certainly of interest and obviously open to empirical investigation.²² Such investigation may in principle discover whether or not there are factors that prevent the interest rate falling to zero (for Japan, of course, we now have the practical experience of short-term interest rates virtually at zero). However, even at exactly zero interest rates there is no incentive for round-tripping by banks. Interest

²¹ Woodford (2003), p.33

²² See for example Miyao (2002)

rates have to fall marginally below zero for this to happen at all. Empirical evidence on what happens as interest rates fall close to zero can therefore provide no evidence at all to confirm whether or not this round-tripping will occur. The argument that, with unlimited supplies of non-depreciating cash, interest rates cannot fall (more than marginally) below zero thus has to be based on the hypothesis that banks will not ignore the opportunity to make riskless profits rather than on empirical evidence.

Proposals have in the past been made for taxing cash, by Gesell²³ in the early part of the last century and by Goodfriend²⁴ at its end, and a tax on cash would certainly make negative interest rates feasible. A 5 per cent per annum tax on cash, for example, would create room for a central bank to force short term money market rates down to around -5 per cent. However, these tax proposals have generally been regarded as impractical.

Gesell's proposal involves bank notes being required to have stamps affixed at regular intervals to maintain validity. The cost of the stamp corresponds in effect to a tax on cash, or equivalently a negative interest rate on cash. The value of a note would be equal to its face value only immediately after the latest stamp was affixed; thereafter it would be subject to an increasing discount until the next stamp was due. Although Gesell's scheme has been implemented in **local** scrips (and was endorsed by Irving Fisher as an emergency measure in the 1930s depression in America) it would clearly be extremely cumbersome and costly if adopted for **national** currency (though that was certainly Gesell's intention, and I am not aware that Gesell had any interest in what are now known as "local currencies"; although his name is now closely associated with the local currency movement, particularly in Japan and to a lesser extent in other countries).

Goodfriend's proposal involves a magnetic strip on the back of notes that would record the date each time a note was issued at a bank or ATM etc. When next paid into a bank the face value of the note would be discounted by a sum proportional to the latest period of circulation. Whereas in Gesell's proposal, all current bank notes would exchange at a discount that would vary over time, but would at any time at least be the same for all

²³ S Gesell *The Natural Economic Order*, available at <http://www.systemfehler.de/en/neo>. See also Buiter and Panigirtzoglou (2003). However, while earlier versions of this paper discussed the implementation of an updated form of the Gesell tax, the authors have omitted all discussion of practicalities from the final version.

²⁴ Goodfriend (2000)

bank notes, under Goodfriend's scheme bank notes would also be depreciating, but different bank notes with the same face value would be subject to different discounts, according to the length of time they had been in circulation. So to calculate the value of a bundle of banknotes tendered in payment one would have to check individually the date on which each had been issued, work out the discounted value of each one, and sum to obtain the total value (or acquire a machine to carry out the operation).

Neither of these proposals, incidentally, have anything to say about coins, which are not amenable to either form of taxation. If coins remained untaxed there would be obviously be some (inefficient) increase in their use, though the authorities could minimise that increase by replacing higher value coins by notes.

Some Japanese commentators and academics publicly advocate the "Gesell tax" as a solution to Japan's economic problems without fully confronting the practical problems of implementation. For example, Fukao in a paper presented at BIS in 2002, argued for a "Gesell Tax on Government Guaranteed Assets" which included the proposal that "banknotes should be taxed. In order to tax cash the Bank of Japan has to print new bank notes and levy fees for exchange. Alternatively, the government can levy stamp duty on old bank notes."²⁵ This technique for taxation of cash is certainly possible, but Fukao does not acknowledge that the conversion of bank notes could not be a one-off event. After one exchange of bank notes, a further exchange has to be expected, in order for the expected rate of return on cash to be below zero. Each conversion would, of course, involve not only the costs of issuing the new notes, but also the cost of altering every vending machine in the country so that it would accept the new notes and reject the notes that were no longer current.

A key—but generally unacknowledged—point about both Gesell's original proposal and Fukao's variant on it (and in a more complicated way Goodfriend's proposal), is that they necessarily involve the separation of the unit of account from the means of payment. Immediately prior to one of Fukao's proposed exchanges, an old 10,000-yen note could obviously not be worth 10,000 yen (as it would be exchanged for a new note, worth at most 10,000 yen only after some payment). Clearly also the value of an old note would not jump, so there must be an extended period in which the value of an old note would be at a discount—and an increasing discount—to its face value. In Fukao's

²⁵ Fukao (2003)

scheme, if there were regular but not too frequent exchanges and the payment for exchange were below some critical level, there would be periods in which the notes traded at par followed by periods in which notes traded at an increasing discount to par. During the periods when the notes were trading at par, overnight and other very short-term interest rates could not be significantly below zero, although longer term interest rates could be below zero, reflecting expectations of future short term interest rates.

Suppose the authorities announce that in two years time the present note issue will become worthless and that it will be exchanged with new notes at a rate of 9,000 yen for each old 10,000-yen note. Suppose for simplicity that it is expected that immediately on issue a new 10,000-yen note will be worth 10,000 yen. If interest rates on bank deposits are, say, zero, then this equates to a similar relative return on cash to that seen when the interest rate on bank deposits is 5 per cent and cash yields a zero return. That has not been an unusual situation in the UK in recent decades (indeed interest rates have often been considerably higher than 5 per cent); but people do not stop holding cash because of such interest rates, or indeed markedly reduce their cash holdings: in econometric work, it has not been straightforward to find a significant interest rate effect on holdings of cash at all²⁶.

Thus it is entirely conceivable that, with a 10,000-yen note legal tender for 10,000 yen, two years or even one year before the exchange, 10,000-yen notes could continue to be exchanged at par. But as the date of exchange, approach willingness to respect the legal tender law would surely break down. The day before the exchange, the negative return on the old cash (valued at par) is close to 100 per cent per annum, so no one is going to want to hold cash overnight on the day before exchange, if they can deposit it at par. Can everyone just deposit cash with their bank, and the banks return it to the central bank, without penalty, the day before exchange? No doubt the economy can perfectly well survive one day without cash, but this arrangement would defeat the whole point of the exercise; it would mean that the effective interest rate on cash was zero for all but the last day before exchange, so that money market interest rates could not be significantly negative, except for that brief period.

²⁶ A very recent Bank of England paper, by Grant *et al.* (2004) finds a stable interest rate effect on demand for cash over the ten years ending in 2002, but not for the previous decade.

But in the absence of some way to avoid the penalty on exchange and the almost –100 per cent per annum interest rate on the last day, by recursion there would be an unwillingness to accept notes at par for some period prior to the exchange. Over this period there would be a growing reluctance to respect legal tender provisions—if these recognised cash as settling debts at par—and cash would be increasingly inconvenient as a means of payment.

The above discussion has left out the role of government transactions in affecting whether cash would be valued at par or otherwise in the periods between conversions. While it is possible, as an intellectual exercise, to think of the government and central bank as price takers, willing to accept cash at par when the economy as a whole accepts cash at par, and requiring the same discount as that generally prevailing in the market when cash trades below par, such an arrangement is hardly plausible. But if the government announces a rate at which it will accept cash, in payment of tax bills, for example, then that rate is likely to be highly influential, to say the least. I will develop this point further below.

What Fukao proposes (and the proposal is similar to one made by Buiter and Panigirtzoglou) in effect gets round the problem of the excessive administrative costs of very frequent small tax payments on currency in Gesell's original scheme with much more infrequent but much larger tax payments. The administrative expenses are indeed greatly reduced, but only at the cost of much greater disruption to the normal use of cash in the period running into the day when the tax is paid (the day of currency conversion).

Thus, while I am fully in sympathy with Professor Fukao's objectives (at least as they applied to the state of the Japanese economy when he presented his paper), I believe it would be desirable to achieve them in a less costly way. I now present a way of achieving the objectives, simply exploiting the possibility of separating the unit of account and means of payment, as discussed in the historical digression above, and not requiring any taxes or repeated conversions of currency notes.

Two schemes for separating the means of payment and unit of account

I present first a scheme—scheme A—which is not actually my preferred scheme, but which is simpler to understand than my preferred scheme, and also facilitates the understanding of my preferred scheme. Under Scheme A, the monetary authorities

would withdraw all existing cash while maintaining the existing monetary unit of account; they would use interest rate policy to achieve an inflation target expressed in terms of this unit of account, as discussed by Woodford.²⁷ Separately, to facilitate transactions, the authorities would make a new issue of cash, which could depreciate in terms of the unit of account. The authorities would, of course, have complete control over the “exchange rate” between cash and the unit of account.

To be more specific, taking the case of the UK as an example, the Bank of England and the Debt Management Office would continue to denominate operations with their counter-parties in pounds sterling, the Government would continue to pay salaries into its employees’ bank accounts in pounds sterling, and to send out tax bills expressed in pounds sterling. But there would be no sterling notes and coins in circulation. Rather a new currency with a different name (“drachma”, say) would be issued which could depreciate relative to sterling. The Bank of England would publish each day on its home page the rate of exchange between the pound and the drachma (rather as the Central Bank of Chile now publishes on its website the daily rate of exchange between the peso and the Unidad de Fomento, the indexed unit of account for many transactions in Chile). With this arrangement, there would be absolutely no obstacle to negative sterling interest rates.

This “pound plus drachma” proposal would involve significant set-up costs (the replacement of sterling notes and coins with drachma notes and coins), and the Government might also want to consider issuing a basic electronic calculator to every household in the country (at the cost of roughly 0.01 per cent of annual GDP). The ongoing administrative costs, however, would be trivial in comparison with Gesell’s stamped currency.

Major set-up costs can be avoided, however, with my preferred scheme: “Scheme B”. It would not be essential for the Bank of England to issue drachmas or withdraw sterling notes and coin. Existing cash could continue to be used, but the value of a ten-pound note, say, would no longer necessarily be ten pounds. The Bank of England would publish daily the value of cash in terms of the sterling unit of account and would of course use this exchange rate in debiting the accounts of banks to which it supplied cash. When the government issued cash (for example, in payment of welfare benefits) or

²⁷ Woodford (2003), pp. 63ff.

received cash (payments for licence fees, or taxes etc.) it would of course use the same exchange rate. Sterling cash would be legal tender to settle debts denominated in sterling at the daily exchange rate. That should be enough to ensure that the unique daily exchange rate was used pervasively throughout the economy.

Eisler made a similar proposal more than seventy years ago²⁸: his idea was that the unit of account (expressed in pounds and decimals)—which he called “money *bancó*”—would appreciate against cash (expressed in shillings and pence)—which he called “current money”. Restaurant menus, for example, would be priced in pounds and decimals: someone paying a restaurant bill by cheque (more likely, these days, by credit card) would simply write out the amount in pounds and decimals. In the case of cash payments, a cashier would consult the daily rate to work out the required cash sum in shillings and pence.

In the 1930s Eisler’s idea was regarded as unworkable; but with the current availability of cheap electronic calculators the need to use an exchange rate to convert prices expressed in the unit of account into cash prices would be a relatively minor inconvenience. It would no doubt lead to some reduction in the use of cash. But the main adverse impact of depreciating cash would be on tax-evaders and drug-dealers, and that hardly seems to be a conclusive reason for rejecting the idea.

The main question over my proposal, and one that Buiter has raised in a reply to my comment²⁹ on his paper with Panigirtzoglou, is not whether it would succeed in achieving negative interest rates, but whether that achievement would mean anything. Going back to my “sterling plus drachma” suggestion, the UK monetary authorities might succeed in stabilising prices measured in sterling terms, but would that mean anything if people were using drachma cash?

Buiter distinguishes between the “shoe-leather” and “menu” costs of inflation. “Shoe-leather” costs are of course the costs of economising on cash holdings—motivated by the lower return on cash than on alternative assets—and thus of having to make more trips to a bank (or ATM machine located in a supermarket or convenience store) to withdraw cash. This is a traditional name, incidentally, which would be better referred to these days as “petrol costs”. In the UK, with the closure of bank branches in rural

²⁸ Eisler (1931)

²⁹ Davies (2005)

areas, people in parts of the countryside have to drive perhaps 10 kilometres to their nearest bank or ATM, or a round trip of 20 kilometres. Thus the “petrol costs” of inflation are not as trivial as the traditional name “shoe-leather costs” makes them sound.

The “petrol costs” of inflation in my proposed “sterling plus drachma” economy are clearly related to inflation measured in drachmas not inflation measured in sterling. So by setting an inflation objective in terms of sterling prices the authorities are doing nothing to minimise these “petrol costs” of inflation. However, there is simply no way of avoiding these “petrol costs” if equilibrium of the macro-economy requires real interest rates to be negative. If the choice is between accepting these “petrol costs” or “ten wasted years” for the macro-economy, then presumably the former would be taken as the lesser of two evils.

What then of the point about “menu costs”, broadly understood as not only the costs of changing price labels, but also the costs of renegotiating prices and wages? The point is that for these costs to be affected by the rate of sterling inflation, the prices have to be set in sterling in the first place. This choice of numeraire is obviously the outcome of private sector decisions.

In the familiar situation in which there is no separation between the unit of account used by the authorities and the cash in use for payments, in normal economic circumstances the unit of account used by the private sector is simply the same as the unit of account used by the authorities. This is not always the case, however, as in periods of high inflation and currency instability the private sector sometimes switches to a foreign currency. In periods of high inflation in recent decades, several Latin American countries saw the adoption of inflation-adjusted units of account. Even after years of low inflation, the inflation adjusted unit of account has survived in Chile, where, as described by Shiller

“Chile’s *unidad de fomento* (UF, or unit of development) is the world’s first indexed unit of account. Created in 1967.... In Chile today, people buy and sell, and sign long-term contracts not only in terms of their currency (the peso) but also in terms of UFs....

The UF is upheld by the government and by the legal system as a unit of account for transactions. If one defines a future payment in UFs, one must later, on the date the payment is made, calculate the payment in pesos by multiplying the UF amount by the

number of pesos per UF shown in the newspaper on that day. People in Chile today will quote the prices of houses for sale and of apartments for rent in UFs, and they specify mortgage payments, tax payments, and even child support and alimony payments in UFs.”³⁰

Shiller, indeed, advocates the introduction of a similar inflation adjusted unit of account in other countries. Niehans, in an interesting discussion of the choice of unit of account as the outcome of minimising accounting costs³¹, had also considered the use of an inflation adjusted unit of account, separate from the means of payment, as a possible measure to cope with inflation; though he saw the separation of means of payment and unit of account as a serious loss of efficiency: it was better to get rid of inflation and avoid the need for separation of the means of payment and unit of account. (Incidentally, Niehans prefers the term “medium of account” to “unit of account”. While his argument has some force, I follow the more general practice here.)

Greenfield and Yeager were also concerned about whether the money of account they proposed, as discussed above, would be adopted by the private sector. In their framework, the government actually has a relatively limited role and this must limit its influence on the private sector’s choice of unit of account. In addition there is I have already emphasised, not merely no cash but no base money at all in Greenfield and Yeager’s proposal. In my proposal base money does exist—denominated in the government’s unit of account.

Both White³² and McCallum³³ argued in discussions of Greenfield and Yeager’s proposal, that the means of exchange would almost inevitably become the unit of account. McCallum makes no reference to—and was perhaps not fully aware of—the historical evidence of separation; while White makes only a brief and disparaging reference to “ghost currencies”—currencies which enjoyed an afterlife as a unit of account after the relevant coinage had ceased to be used as means of payment—whose significance, he claimed, had been overplayed. He likewise does not seem to be fully aware of the history of separation, which goes much wider than the case of “ghost currencies”.

³⁰ Shiller (2003), pp.204-205

³¹ Niehans (1978) pp. 118-139

³² White (1984)

³³ McCallum (1985)

Buiter argues that with my “sterling plus drachma” proposal I am in fact creating two possible focus points for the private sector’s choice of numeraire: the public sector’s unit of account and the unit of cash. As the private sector will be transacting in cash on a day-to-day basis, it may end up adopting the unit of cash as its numeraire, rather than the public sector’s unit of account. Clearly there is room for argument here, and clearly Woodford is wrong, as Buiter argues, when he **defines** the unit of account as the unit which the government and monetary authorities use: “The special feature of central banks, then, is simply that they are entities whose liabilities happen to be used to define the unit of account in a wide range of contracts that other people exchange with one another.”³⁴ The unit of account is ultimately a private sector choice, not a central bank definition.

In normal economic circumstances, however, there is good reason to believe the private sector will simply follow the public sector. First, the government accounts for a large share of the economy: in the case of the UK, government spending and taxes account for roughly 40 per cent of GDP. By denominating payments to its suppliers and its own employees, as well as transfer payments and tax bills in terms of sterling, sterling would have a very privileged position compared with the drachma. This could be enhanced by the government requiring all shops to show prices in sterling rather than drachmas (just as they recently required shops to switch to metric measures of weight from the long-familiar imperial measures). Shops would in any case prefer to use sterling price tags, as sterling inflation would by assumption be lower than drachma inflation and therefore their “menu costs” would be lower if they used sterling rather than drachma price tags: they would have to change the price tags less frequently.

The authorities would also conduct all their transactions with commercial banks in sterling. As the banks would have sterling-denominated borrowing from/ deposits with the Bank of England and Debt Management Office, they would minimise market risk, other things being equal, by lending to their retail customers in sterling and taking retail deposits in sterling. They have no obvious reason to push their customers in the direction of drachma deposits, or borrowing in drachmas.

Sterling also has the competitive advantage that is what people in the UK are used to.

³⁴ Woodford (2003) p.37

They have most of their debts and assets denominated in sterling already. Non-cash retail payments would presumably continue in sterling initially, as would wholesale payments: there is no reason why non-cash payments should be affected by the change from sterling to drachma cash. It thus is hard to see how the drachma would establish itself as unit of account in preference to sterling. Why would people move away from the unit of account they are used to, and which they will continue to be required to use in all their dealings with government, to a unit of account that it is, after all inferior (in the sense that it is subject to a higher, and possibly more variable, inflation rate)³⁵? This seems similar to abandoning a superior keyboard layout and adopting QWERTY.

Some anecdotal evidence of private sector inertia in use of unit of account (which, in the context of the argument above, would favour the continued use of sterling over the drachma as the private sector's unit of account) is available from 19th century France, following the Napoleonic reforms which introduced the franc both as cash and as the government's unit of account. Weber gives several examples of people using the ecu and/or pound as numeraire decades after their replacement by the franc; for example, a land-owner in northern France who "kept his accounts in *ecus* until 1837, in *sols* until 1849...and in *livres* and francs interchangeably, as if they were one and the same thing, all the way to 1877"³⁶.

The concern over the private sector not adopting the government's unit of account would in any case be less in my (preferred) case B. In this case there is no rival unit for cash (drachma) that could be adopted as unit of account.

National money of account with quasi-free banking

One possible arrangement would be to combine a national money of account with cash provided competitively by private banks. In principle, there is no reason why this could not take a form that might perhaps be described as "free banking", even though the outside money—the reserves of the banking system would be different from those in past episodes of "free banking". As Selgin and White put it:

"Most discussions of free banking assume that the monetary base does not include

³⁵ McCallum (1985, p.5) notes, in a discussion that is generally sceptical about the sustainability of a unit of account separate from the means of payment that "there can be inducements—such as the presence of substantial inflation in terms of the MOE—for agents to make contracts in terms of something other than the MOE". (n.b. McCallum's MOE stands for "means of exchange"—what I am calling "means of payment".)

³⁶ Weber (1976) p.33

currency or deposits issued by an extant central bank. By itself, however, free banking does not uniquely specify the base money regime. Base money could be gold or silver.... Or it could be some fiat money.”³⁷

“Free banking” is of course normally taken to involve banking without a central bank. A nominal anchor is provided by the convertibility of bank notes into gold or silver. With fiat money, some authority like a central bank is needed to control the fiat currency or provide a nominal anchor: e.g. to set interest rates on it in accordance with an interest-rate rule. But this authority would not supervise banks or involve itself in the banking system in any way. It might be help to differentiate this situation from classic free banking by calling it “quasi-free banking”.

If the main national banks all issued their own notes, they might compete by offering different rates of interest (positive or negative) on their notes; and the notes, though all denominated in the money of account, might trade at a premium or discount to that unit of account, and to each other. (The historical experience of free banking in the US confirms this possibility, though in Scotland bank notes normally traded at par in its free banking period.) Of course the stability of free banking (both in theory and in the historical record) is open to argument. The stability of the Scottish system probably owed a great deal to the unlimited liability of equity holders, which should have helped restrain any temptation to “gamble for resurrection”. It is not clear that unlimited liability would be sustainable or credible today with the inevitable media focus on hard cases.³⁸

Local moneys as means of payment

The authorities would make it more difficult for an alternative unit of account to emerge if they did not issue national bank notes. One option would be to delegate the issuance of cash to local government bodies. Although central government might be reluctant to

³⁷ Selgin and White (1999)

³⁸ Shareholders of the City of Glasgow Bank which collapsed as a result of fraud in October 1878, included “bakers...builders, drapers, artists, portioners, grocers, clothiers, tobacconists...” according to Buchan (1997), p.212. All were exposed to unlimited liability. It is true that the UK government managed to resist pressure to bail out “names” in the Lloyd’s insurance market in the 1980s and 1990s, many of whom were impoverished or ruined by their unlimited liability for meeting claims, but they were mainly members of a much smaller social group who aroused limited public sympathy. By contrast, the Government has moved quickly to address a legal quirk that could have left Equitable Life policyholders exposed to unlimited liability.

lose the seigniorage revenues from currency issuance (in the normal circumstance of positive interest rates on government bonds), this could be part of an overall reform of the structure of financial flows between central and local government and could be offset by a reduction in other central government transfers to local government.

How might this work? I should stress that I do not envisage local governments paying their employees and suppliers in local currency³⁹. They would still generally pay them (by bank transfers etc.) in the national money of account; they would also raise local tax in the national money. The local cash would be supplied to fill a need mainly for small-scale local transactions, for which locally issued and locally familiar cash would be acceptable; indeed it might play a valuable role as a contribution to community solidarity. (Just as nation states generally see national currency as a way of building a sense of national identity⁴⁰. One might also suggest that the EU has seen the abolition of national currencies as a way of reducing the sense of national identity within Europe.)

To obtain cash from their local authority, people would transfer national currency from a bank account into their local authority's bank account. In return the local authority would issue them with the local cash. The local cash could be denominated in a unit that might be fixed in terms of the national currency, though the local authorities might seek to increase their seigniorage revenue by making the local currency unit depreciate in terms of the national money of account. (And if there were negative interest rates on assets denominated in the national money of account, they would have to allow the local money to depreciate if they were not to make losses on the issuance of local money.)

An alternative would be to have private banks, rather than local authorities issue cash. However, there is some advantage in local authorities rather than commercial banks doing this as their power to raise local taxation would help to back the currency. There should be less risk of a flight from cash occasioned by worries about the viability of the issuer.

There should be no need for local legal tender laws, requiring local businesses to accept

³⁹ It is true that in Argentina, for example, in a situation of financial and fiscal crisis, local governments paid their employees in local money; but, except in extreme circumstances, one cannot seriously expect that employees will accept payment in a currency that cannot be used outside a limited local area.

⁴⁰ As emphasised by Helleiner (2003).

the local cash⁴¹. Local businesses are not likely to refuse the cash their customers have in their purses and wallets, provided they are assured of being able to convert it back into national money by depositing it at their bank. Local currency might be used outside the area of the authority that issued it, but one would imagine that it would be increasingly unfamiliar and less readily accepted at greater distance from the issuing area. (This was the English experience in the eighteenth and early nineteenth century, when the note issue was almost entirely supplied by local banks. These banks' notes were not generally accepted outside the area of issuance.) There could, however, be some competition between neighbouring local authorities over the rate of depreciation of their cash, if more than one local authorities' cash was accepted in border areas. A local authority would then face a revenue maximisation problem: a faster rate of depreciation would increase its seigniorage revenue for given cash issuance but reduce the demand for its cash.

I have suggested that one reason for issuing local cash rather than a single national cash would be to reduce the competition with the government's unit of account. A decision not to have a single national cash is, to be realistic, hardly likely to be taken for this reason alone. It must also be understood as an attempt to throw grit into the wheel of national commerce and mobility. It would create some inconvenience for those travelling from one part of the country to another that the cash they used in their own locality would be unfamiliar and might not be an acceptable means of payment in another locality. (Of course, credit card and bank transfer payments in the national currency would be available and there would presumably be a drastic reduction in cash payments for restaurant and hotel bills, for example.)

The case for such interference with market mechanisms could be sociological: that competition between successful growing regions and more backward regions was disrupting local communities in the more backward regions. Or it could be based on concerns about income distribution: that those with property rights in the more backward regions were losing money relative to those with property rights in the more successful regions, and there was no non-distortionary way to implement transfers to offset these losses. Or it could be based on externalities: that the population movements

⁴¹ Note that within the UK, while Bank of England notes are legal tender in England and Wales, there are no legal tender bank notes in Scotland; but that forms no impediment at all to the acceptability of either Bank of England bank notes or notes issued by Scottish banks in discharge of debts in Scotland. Scottish bank notes can also normally be used without any problem in England, despite their lack of familiarity.

prompted by regional imbalances are inefficient because those moving are not affected by the additional costs imposed on the public sector by their moves (e.g. the need to build new schools and hospitals in the growing area).

One could make a (somewhat far-fetched) analogy with the *hansatsu*, the paper money (denominated normally in silver or gold, sometimes in rice) that many feudal domains (hans) issued in the Edo period in return for deposits of specie, which in theory backed the paper currency issue, and in payment for local services. Inhabitants of domains that issued such paper money were normally required to use the domain paper money for cash payments within the domain area, with spies sometimes employed to check that specie was not being used. However, I cannot see any analogous compulsion being acceptable in modern Japan: people would have to be free to use the electronic form of national money if they wanted to. And in any case the vast increase in mobility and the centralisation of the economy (not to mention globalisation) makes any analogy with the monetary arrangements of the Edo period (when there were strict border controls between the different “*kuni*”) of limited relevance today.

Some Japanese advocates of local currencies may find my suggestion for the nature of local government issuance too limited: they would want to see local currencies playing a bigger role in local government finance. As I have argued elsewhere, however, it is not realistic to expect local government employees (other than those doing voluntary work) and suppliers to agree to be paid in a local currency that is not convertible into the national currency, except in financial crises where the employees face the alternative of accepting a temporary local money or nothing (and where no alternative employment is available)⁴².

The arrangement I suggest seems to me the most that can be realistically hoped for in terms of the contribution of local money to local finance. It could of course be additional to local moneys used to remunerate volunteers (the role of which is more to provide a significant way of recording and expressing appreciation for the volunteers’ activities than to provide a source of income); and also additional to private arrangements such as LETS (Local Exchange Trading Schemes) which finance transactions between scheme participants. The latter may perhaps be best thought of as attempts to alleviate the “institutional crowding out”⁴³ of trust-based relationships by the monetary economy;

⁴² Davies (2003)

⁴³ I have taken this term from Bowles (2004), p.495. For a recent formal theoretical

they have no direct relevance to local government finance⁴⁴.

What about “e-money”?

It is cash in material form that creates the problem of the zero interest rate bound. My assumption is that material cash will continue to have attractions for use in small-scale transactions, that its replacement entirely by new de-materialised forms of money (such as e-purses) would increase transactions costs, as demonstrated by Goodhart and Krueger.

In thinking about e-money, one needs to make a distinction between “inside e-money” (what most people think of as e-money, and the only sort that currently exists anywhere, as far as I am aware), and “outside e-money”, created by monetary authorities. At present, the authorities in Singapore are planning to replace cash by “digital legal tender”⁴⁵, but the details of the scheme have not been published. Conceptually, it may bear some relationship to Tobin’s scheme for “deposited currency”, under which cash would be abolished and individuals would hold deposit accounts in local branches of the central bank, perhaps located in post offices⁴⁶. As Tobin notes, interest could be paid on such deposits (obviously he would have been thinking in terms of a positive interest rate, but if there were no currency but “deposited currency” then a negative interest rate would be equally feasible). In discussing this proposal, the Singapore authorities have stressed, as one of its advantages, the facility for making interest payments on digital legal tender. They clearly have in mind positive interest payments, but negative interest payments would be equally unproblematic.

The main relevance of “inside e-money” is that it could make it somewhat easier to fill the gap left in payments mechanisms if the monetary authorities decided to solve the problem of the zero interest rate bound by simply not issuing cash. If the authorities implemented negative interest rates, issuers of inside e-money—simply to avoid bankruptcy—would have to find some way of making e-money depreciate: e-purses would have to lose value if unspent. (Alternatively, they could have an expiry date. A bus or telephone card, with which bus fares and telephone calls are paid for in advance, might be valid for only three months after purchase, say. Some forms of pre-paid cards

discussion of the replacement of norms of reciprocation by money see Araujo (2004)

⁴⁴ I discussed LETS in detail in Davies (2004)

⁴⁵ Kok (2002)

⁴⁶ Tobin (1985)

already embody such expiry dates, for other commercial reasons.) Pre-paid airtime on mobile phones (which will increasingly be usable like an e-purse to make a range of purchases) would also have to depreciate if not subject to an expiry date. Payment of items through surcharges to a post-paid mobile phone bill—another area of e-money with substantial growth potential—involves only unit of account money, not cash⁴⁷.

Concluding remarks

The method of achieving negative interest rates I have described in this paper certainly works, but there are two possible lines of objection to it. The first is that it would be confusing for the citizens of a country operating it, and would increase the costs (broadly defined) of cash transactions. The second is that while one might achieve negative interest rates in terms of what one might term a “government-sponsored unit of account” that would not have any significance if the private sector participants in the economy adopted an alternative unit of account.

In reply to the first question, I would point out that what one has to compare are the costs of my solution and the costs of prolonged macro-economic paralysis, if that is the alternative (as it has been in Japan). I would also point out that historically people have coped with much more confusing monetary regimes (with numerous coins from different countries with different weights and fineness, and different degrees of wear and clipping) all without the benefit of electronic calculators and without the option of simple electronic transfers of money. In reply to the second I have pointed out the pervasive influence of government transactions, and argued that the private sector has no obvious motive to abandon the government-sponsored unit of account and little reason to adopt a (higher inflation) alternative.

My proposal also ties in with the advocacy of local currencies, issued as means of payment, as these would be even less likely than a nationwide means of payment to threaten to supplant the role of a government sponsored national money of account.

References

- Helen Allen *Innovations in retail payments: e-payments* Bank of England Quarterly Bulletin Winter 2003, pp428-438.
- Luis Araujo *Social Norms and Money* Journal of Monetary Economics 51 (2004)

⁴⁷ A concise summary of the use of the potential use of mobile phones for payments can be found in Allen (2003), p.430

pp.241-256

Fischer Black *Banking and interest rates in a world without money: The effects of uncontrolled banking* Journal of Banking Research (1970) 1, pp8-20

Samuel Bowles *Microeconomics* Russell Sage Foundation (2004)

James Buchan *Frozen Desire* Picador (1997)

Willem H Buiter and N Panigirtzoglou *Overcoming the Zero Bound on Nominal Interest Rates with Negative Interest on Currency: Gesell's Solution* The Economic Journal 113 (October 2003), pp.723-746.

Willem H Buiter and N Panigirtzoglou *Reply to Davies* mimeo, May 2004

Tyler Cowen and Randall Kroszner *The Development of the New Monetary Economics* Journal of Political Economy 1987 vol. 95, no.3 pp. 567-590

Stephen J Davies *Japan's Deflation and the Feasibility of Negative Interest Rates* Kobe Economic & Business Review 47 (2002), pp.93-115

Stephen J Davies *Local Currencies—Lessons from the World* in Yasuo Konishi (ed) *Local Currencies—Sono Genjou to Kadai* Kobe University 2003, pp.1-38.

Stephen J Davies *Lessons from LETS* Kobe University Kokumin Keizai Zasshi Vol 189 No2 (February 2004) pp. 55-70

Stephen J Davies *Comment On "Overcoming The Zero Bound On Nominal Interest Rates With Negative Interest On Currency: Gesell's Solution"* Submitted to The Economic Journal (2005)

Robert Eisler *This money maze : a way out of the economic world crisis* London : Search Pub. Co 1931

Luigi Einaudi *The Theory of Imaginary Money from Charlemagne to the French Revolution*, chapter 14 of Frederic C Lane and Jelle C Riemersma (eds) *Enterprise and Secular Change* George Allen and Unwin 1953. (Translation of article which appeared originally in Rivista di storia economica 1936, I, 1-35.)

Eugene F Fama *Banking in the Theory of Finance* Journal of Monetary Economics 6 (1980) pp. 39-57

Benjamin J Friedman *The Future of Monetary Policy: The Central Bank as an Army with only a Signal Corps?* International Finance 2, pp. 321-338 (1999)

Mitsuhiro Fukao *Financial strains and the zero lower bound: the Japanese experience* BIS Working Papers No. 141 (September 2003)

M Goodfriend *Overcoming the Zero Bound on Interest Rate Policy* Journal of Money Credit and Banking (November 2000) part 2, pp.1007-1035

Charles AE Goodhart *Can We Improve the Structure of Financial Systems?* European Economic Review 37 (1993), pp. 269-291

Charles AE Goodhart and M Krueger *The Impact of Technology on Cash Usage* LSE Financial Markets Group Discussion Paper 374 (April 2001)

Kathryn Grant, Gertjan Vlieghe and Andrew Brigden *Assessing the stability of narrow money demand in the United Kingdom* Bank of England Quarterly Bulletin Summer 2004, pp131-141.

Robert L Greenfield and Leland B Yeager *A Laissez-Faire Approach to Monetary Stability* Journal of Money Credit and Banking Vol 15 No 3 (August 1983) pp.

Robert E Hall *Controlling the Price Level* National Bureau of Economic Research Working Paper 6914 (January 1999)

Ian R Harper and Andrew Coleman “*New Monetary Economics*” in Peter Newman, Murray Milgate and John Eatwell (eds.) *The New Palgrave dictionary of money and finance* Macmillan 1993, vol.3, pp. 28-31

Eric Helleiner *The Making of National Money: Territorial Currencies in Historical Perspective*. Cornell University Press (2003)

David Humphrey, Aris Kaloudis and Grete Owre *The future of cash: falling legal use and implications for government policy* Journal of International Financial Markets, Financial Institutions and Money 14 (2004) pp. 221-233.

Joel Kaye *Economy and Nature in the Fourteenth Century* Cambridge University Press 1998

Narayana R Kocherlakota *The Technological Role of Fiat Money* Federal Reserve Bank of Minneapolis Quarterly Review Vol. 22 No. 3 (Summer 1998) pp.2-10

Low Siang Kok *Singapore Electronic Legal Tender (SELT)—A Proposed Concept*, chapter 6, pp.147-156 of *The Future of Money* OECD 2002

Bennett T McCallum *Bank Deregulation, Accounting Systems of Exchange, and the Unit of Account: A Critical Review* NBER Working Paper No. 1572 (March 1985)

Bennett T McCallum *Monetary Policy Rules and the Japanese Deflation* Paper prepared for the March 20, 2002, workshop sponsored by the Economic and Social Research Institute of the Japanese Government

Ryuzo Miyao *Liquidity Traps and the Stability of Money Demand: Is Japan Really Trapped at the Zero Bound?* Kobe University RIEB Working Paper, October 2002

Jurg Niehans *The Theory of Money* The John Hopkins University Press 1978

Kunio Okina and Shigenori Shiratsuka *Asset Price Bubbles, Price Stability, and Monetary Policy: Japan's Experience* Bank of Japan Institute for Monetary and Economic Studies Discussion Paper 2001-E-16

Thomas J Sargent and Francois R Velde *The Big Problem of Small Change* Princeton University Press 2002

George A Selgin and Lawrence H White *How Would the Invisible Hand Handle Money?*
Journal of Economic Literature Vol 32 (December 1994) pp. 1718-1749

Robert J Shiller *The New Financial Order* Princeton University Press 2003

Peter Spufford *Handbook of Medieval Exchange* London: Royal Historical Society 1986

James Tobin *Financial Innovation and Deregulation in Perspective* Bank of Japan
Monetary and Economic Studies Vol.3 No.2 (September 1985) pp19-29

Eugen Weber *Peasants into Frenchmen: the modernization of rural France, 1879-1914*
Stanford University Press 1976

Lawrence H White *Competitive Payments Systems and the Unit of Account* American
Economic Review Vol 74 no 4 (September 1984) pp.699-712

Knut Wicksell *The Influence of the Rate of Interest on Prices* The Economic Journal 17
(June 1907), pp.213-220

Michael Woodford *Interest and Prices* Princeton University Press 2003