Does Monetary Policy Have a Future?

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Central bank or base money lies at the heart of modern monetary systems. Unlike other money, it does not confer on its holder a claim to another type of money, but is instead the ultimate settlement asset in monetary exchange. This property makes base money a natural medium of account, and so it is no accident that prices in all developed economies are expressed in terms of its units. Of course, modern base money has no intrinsic value—except perhaps for papering walls—and has had no fixed exchange value against goods and services since the abandonment of the gold standard. Instead, its value (and, hence, the price level) is determined by the central bank's supply of it, on the one hand, and the public's demand for it, on the other. Other things being equal, as the demand for it rises, its value rises and the price level falls; and as the demand for it falls, its value falls and prices rise. Any factors that affect its demand could therefore have consequences—and potentially serious ones—for price and monetary stability.

This paper suggests that there is a very real prospect of such instability in the not-too-distant future. We argue that the demand for central bank money will not only drastically fall, but also probably disappear altogether, over a foreseeable horizon. Prospective technological progress with electronic payments and settlements systems is likely to combine with ongoing institutional changes—such as shifts toward private-sector settlements systems—to eliminate the demand for central bank money. Given that the price level depends on that demand, these developments carry the seeds of a profound monetary policy problem emerging in the

Cato Journal, Vol. 21, No. 2 (Fall 2001).

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future.[1] If central banks do not reduce the supply of their own money, a falling demand for it will produce rising inflation and eventual hyperinflation. To avert such an outcome, central banks would need to reduce the monetary base in line with the falling demand for it. Unfortunately, such a policy is difficult to implement and would impose large—and potentially crippling—financial costs on central banks. Furthermore, as the demand for base money continued to fall, the price level would become increasingly volatile in the face of shocks, and there is a clear danger that our current discretionary monetary policy regime would, if continued, lead to escalating monetary instability.

This paper is laid out as follows. We begin by outlining the role and importance of the monetary base in the monetary system, and in so doing highlight its pivotal role as the lever on which monetary policy operates. We then look at the development of new payments media that compete with central bank currency and examine prospects for the other component of base money: commercial bank deposits at the central bank. The implications of a falling demand for base money for central banks and their ability to conduct discretionary monetary policy are then discussed. We next evaluate the likelihood that the demand for base money will disappear entirely, and discuss the implications of a zero demand for base money. Finally, we address possible policy responses and assess central banks' prospects. Our conclusions are that discretionary monetary policy is unsustainable, and that the future of central banking looks bleak.

The Monetary Base as the Lever of Monetary Policy

It is perhaps best to begin by considering how monetary policy actually works. The key to monetary policy is the central bank's monopoly control over the monetary base, which consists of conventional (central bank) cash in circulation and commercial bank deposits held at the central bank. When the central bank buys securities, it does so by increasing the monetary base, and the extra monetary base created in this way gradually percolates through the monetary system until a new equilibrium is reached. This new equilibrium also involves a higher price level. Conversely, when the central bank sells securities,

[1]A number of recent articles have also examined the implications of electronic currency and related developments for central banks, including Browne and Cronin (1995, 1997), Dorn (1998), Dowd (1998), Freedman (2000), Friedman (1999, 2000), Goodhart (2000), King (1999), Krueger (1999) and Selgin and White (2000). Most of these assessments are fairly gloomy about central banks' future prospects, and only Freedman and Goodhart (and arguably Krueger) hold out much hope for them.

it decreases the monetary base, and the monetary system eventually finds a new equilibrium consistent with the lower monetary base. This equilibrium involves a lower price level. The central bank's operations also affect the prices of the securities bought and sold, and so affect interest rates, at least in the short term. There will also be knock-on effects on economic activity, inflation, and so on.

The central bank's ability to conduct monetary policy is thus critically dependent on its monopoly control of the monetary base—and on the underlying premise that there exists a public demand for monetary base in the first place. At the same time, it is true, as many observers have noted, that the central bank can often influence interest rates merely by making appropriate public statements. The markets will then use these statements to anticipate central bank action, and respond accordingly. However, as Friedman (1999: 326) points out, the argument that the central bank can talk markets up or down "makes sense only if the central bank can credibly affect widely shared expectations of future short-term interest rates, and . . . that in turn makes sense only if the central bank can indeed affect short-term interest rates when the time comes." Even though the central bank can sometimes talk interest rates up or down, its influence over the monetary system still ultimately depends on its ability to manipulate the supply of base money. Yet there are good grounds to believe that the demand for base money is likely to fall very significantly, and probably disappear entirely, over the foreseeable future.

The Development of New Payments Media

One reason relates to the development of electronic payments media that reduce the demand for both cash and conventional bank money. These media include debit cards, digital cash shorted on computer hard drives, electronic cheques, and prepaid cards (alternatively known as "smart cards" or e-purses) that allow the transfer of funds without the direct involvement of a financial institution, and various special purpose cards such as phone cards and transport cards. These new payment instruments are specifically designed for undertaking small- and medium-sized transactions and, as such, are obvious substitutes for conventional cash.

These instruments have various advantages over traditional currency.[2] Cards are easier to carry, more secure and, because they don't

[2]To some extent, the replacement of conventional currency by electronic currency mirrors the replacement of coinage by bank currency in an earlier age. Bank currency was more convenient and less costly to store than coins, and where it was allowed it eventually displaced coins almost entirely (e.g., in free-banking Scotland).

circulate, usually cleaner than cash. Electronic currency also makes it easier to offer pecuniary returns to holders. Since value is stored digitally, there are no great technical difficulties paying interest on the unspent balances on prepaid cards. The payment of interest on debit cards is even easier, because interest can be simply credited to the holder's bank account. Digital technology easily avoids the notorious difficulties of paying interest on conventional cash.[3]

Electronic payments media also tend to be cheaper to handle than conventional currency and paper-based payment instruments. Persuading customers to switch away from paper to electronic-based payment media would substantially reduce those institutions' operational and security costs. For example, Humphrey, Pulley and Vesala (2000: 35) estimate that in the United States the cost of an electronic payment is about one-third to one-half of a comparable check payment and that savings of $91 billion per annum could be made if the United States switched to electronic payments. A shift to electronic payments would therefore produce a major fall in the cost of a country's payments system, and would yield cost savings to financial institutions and their customers. Electronic payments media would also reduce merchants' currency-holding and other costs, and their vulnerability to theft.

Newer payments media also offer advantages over conventional media when it comes to dealing with fraud. Some forms of digital payment help to combat fraud by providing easy and reliable means of ascertaining the good standing of prospective users, and others use cryptographic or biometric technologies to prevent improper use (see, e.g., Chaum 1992).

Nonetheless, it is often argued that cash has an advantage over electronic payments media in providing anonymity to its users (e.g., when dealing in black-market activities). Thus, Goodhart (2000: 192) writes:

> Currency is completely *anonymous*, whereas—at least up till now with the development of e-purses—e-transfers have facilitated, and proliferated, record-keeping of agents' expenditure patterns. Currency is anonymous in the sense that the recipient of a cash payment neither has to know, nor learns, anything about the counter-

[3]The difficulties of paying interest on cash were nicely set out by White (1987). Of course, it is not impossible to pay a return on cash, and Goodhart (1986) and McCulloch (1986) have each suggested that such a return could be paid by offering lottery prizes on the serial numbers of notes. However, there are good grounds to believe that this form of return would be less desirable, because most people would prefer to receive their returns in other ways; or be socially inefficient, because (as Goodhart 2000: 191, n. 5 himself acknowledges) people would spend too much time checking the serial numbers on their notes.

> party in the process of trade. The only information required is whether the note . . . is genuine or counterfeit.

He then suggests that users who desire anonymity will still prefer to use cash even when e-purses are developed that allow anonymity. Users might be concerned about counterparties or others recording the transaction and about the possibilities of hacking (i.e., breaches of security) and electronic equipment going wrong. He concludes that "if a transactor wants anonymity in e-transfers, it will not only be necessary for that to be *technologically* possible; it will still require *trust* between counterparties, and . . . that will be unlikely" (Goodhart 2000: 194).

This is a good argument, but there are also strong counter-arguments. Cash has security risks of its own, as Goodhart (2000: 193) acknowledges and those who have been mugged near cash machines can confirm. And, as Mervyn King points out, "there will always be a demand for anonymity," but the "question is how that will be provided" (quoted in Goodhart 2000: 199, n. 18). King also observes that encryption technology has already reached the stage where even the security services cannot break private-sector codes, and suggests that it is quite possible that e-currency will provide the privacy that consumers want. He goes on to point out that recent money-laundering legislation has in any case markedly reduced the anonymity of cash payments. King also stresses that what criminals fear is not so much insecure technology as such, but the danger that financial institutions will reveal information about their transactions to the authorities, and concludes that there is "no significant difference between cash and electronic payments in terms of anonymity" (quoted in Goodhart 2000: 199, n. 18). Whatever anonymity advantages conventional cash once had would appear to be disappearing.

Furthermore, there is clear evidence that newer payments media are already reducing the demand for more conventional means of payment. For example, Humphrey, Pulley and Vesala (1996: 936) provide empirical evidence that a "movement toward greater use of electronic payment methods, though gradual, is unmistakable both across countries and over time." This conclusion is confirmed by later studies by Boeschoten (1998), Hancock and Humphrey (1998), and Snellman, Vesala and Humphrey (2000).[4] However, the evidence also

[4]Another factor suggesting that the adoption of new payments instruments will proceed much further is the presence of network factors. As new payments instruments become more widely used, the incentive for new users to adopt them increases (e.g., in much the same way as the incentive to get a telephone rises with the number of people who already use phones). As network factors come into play, we would expect the adoption of new payments media to accelerate and their usage to rapidly become widespread.

indicates that the process of replacing conventional means of payment by electronic ones is—thanks largely to U.S. regulatory obstacles—more advanced in Europe than it is in the United States (Humphrey, Pulley, and Vesala 2000).[5]

Prospective Developments for Central Bank Deposits

We turn now to consider the demand for the second component of base money, commercial bank deposits at the central bank, and there are various reasons to expect this demand to fall as well. One reason arises because the commercial banks have an incentive to economize on (i.e., reduce the demand for) central bank deposits for settlement or reserve purposes; banks will therefore reduce their demand for central-bank deposits when reserve requirements are relaxed or abolished, or become avoidable. To some extent, such efficiency gains have come about as reserve requirements have been abolished (or where they remain, have become avoidable) in one country after another,[6] and banks responded by reducing their reserves to levels consistent with their own judgments of what they needed. Efficiency gains have also come about as settlement procedures themselves have been reformed to cut down on settlement costs.

More fundamentally, there is no compelling economic or technological reason why banks should use central bank deposits for settlement purposes in the first place. The use of such deposits to settle clearing debts is due to the combination of legal restrictions (e.g., against private banknotes or other substitutes for base money) and convention encouraged by the central bank itself, and alternative arrangements are easy to imagine. In principle, banks can use just about any settlement medium they like. For instance, they might settle clearing debts by transfers of clearinghouse certificates at the

[5]There are also reasons why the demand for base currency might increase, but neither of these affects the argument that electronic currency is displacing cash. One reason is the one-off increase in the demand for money associated with the move to long-term low inflation, and the other is the dollarization movement, which increases the foreign demand for U.S. dollars. However, the demand for U.S. dollars will peak once the dollarization process is completed and, in the meantime, the replacement of conventional cash by electronic currency continues.

[6]Most reserve requirements have been abolished in developed countries. But even where they remain, they have become avoidable because of IT developments such as accounting programs that sweep reservable deposits into nonreservable forms to avoid reserve requirements. As Jordan and Stevens (1997:121) aptly put it, "Reserve requirements already are becoming a dead issue, killed by technology and competition."

end of each day. Alternatively, they could settle clearing debts by real-time transfers of marked-to-market assets (see, e.g., Browne and Cronin 1995, 1997). A debt of $1 million could be settled by transferring $1 million worth of specified assets, rather than writing out a check for the same amount, and such an arrangement would involve no central bank deposits whatsoever. Such arrangements also have the attraction of giving banks market rates of return on their settlement reserves, instead of the low or zero rates central banks have usually paid them on their deposits. The prospect of greater returns provides a major inducement for commercial banks to seek alternative settlement assets to replace central bank deposits.[7]

Such alternatives are also nothing new. For example, in the later 19th century, U.S. banks settled their clearing debts by transferring certificates issued by their local clearinghouse associations (Timberlake 1984: 3). These clearinghouse certificates replaced specie as the main settlement medium, and enabled the banks to economize on their (costly) specie holdings—the equivalent of modern-day base money. Similarly, White (1995: 28) reports that Scottish free banks in the 18th century used drafts or bills drawn on correspondent banks in London as clearing media, as well as specie. The historical evidence confirms that there is no pressing reason for banks to use central bank money for settlement purposes.

In fact, there is no reason why the central bank should be involved in the settlement process at all. Central banks do not have any technological advantages over the private sector as providers of such services, and there are already a number of widely used private settlement systems (e.g., the CHIPS system in the United States) that compete with existing central bank systems. In any case, it is also hard to see central banks competing successfully in this market. As technology continues to improve and competition among providers continues to increase, as they surely will, the more successful providers will be those that innovate more, cut costs faster, and come up with better and more attractive settlement procedures. These providers are more likely to be the commercial ones that are already seeking profits (i.e., private-sector providers), rather than central banks that are less used to profit-seeking and less well organized to succeed in it. So unless central banks succeed in gearing themselves up to seeking

[7]We are aware that there is a general movement toward real-time gross settlement (RTGS), and RTGS procedures can involve an increase in the demand for settlement media. However, clearinghouse certificates or higher-yielding marketable assets are better settlement media than central bank deposits, so it is hard to see how the latter will survive as settlement media in RTGS systems in the long run.

profits, they are likely to lose their share of the settlement market to private-sector competitors as time goes by. And yet, if central banks *do* succeed in embracing the profit motive enough to maintain their market shares, it must be asked whether they would really remain central banks at all. As Goodhart and others have often pointed out, a *sine qua non* of a central bank is its freedom from the constraints of the profit motive, and a central bank that maximizes profits is not a recognizable central bank. Either way, central banks as we currently know them are unlikely to remain in the settlements market for much longer.

Implications of a Falling Demand for Base Money

A falling demand for base money has a variety of implications. A fairly obvious one is that if the demand for base money falls while its supply remains the same, the only way the market for base money can clear is for the value of base-money units to fall or, equivalently, for prices to rise. Furthermore, our theoretical work suggests that ongoing technological progress could lead to rising inflation, rather than steady inflation, unless the central bank succeeds in reducing the supply of base money to match the falling demand for it (Dowd and Cronin 2000: 6–9).[8]

A declining demand for base money would also make the price level (and interest rates, asset prices, etc.) more vulnerable to shocks, and especially to changes in the technological and other factors that influence the market for currency. Our theoretical work suggests that technological changes, including shocks, will have an increasingly large effect on the equilibrium price level as the demand for base money declines, with the clear implication that the price level will become more and more unstable in the face of further changes in e-technology (Dowd and Cronin 2000: 9–11).

Others disagree. For example, Jordan and Stevens (1997: 116, 119–20) suggest that there are no reasons to believe that a smaller demand for base money will make it more difficult for central banks to maintain monetary stability. Nonetheless, as a matter of theory, whether or

[8]In this model, technological progress could take one or more of three different forms—lower costs of production for e-currency, an increase in the rate of return on e-currency relative to the return on nonmonetary assets, and an increasing elasticity of substitution between conventional cash and e-currency. For any given base money supply, continuing technological progress in any or all of these forms would lead to rising inflation because of the convexity of the price-level/base-money equilibrium equation.

not a reduced demand for base money would lead to greater monetary instability depends on the model one uses. The most familiar model would be a stochastic version of the textbook money multiplier model, and such a model would certainly suggest they are correct. However, this type of model is of dubious relevance because it does not take account of any electronic currency factors. By contrast, our model (Dowd and Cronin 2000) does take account of electronic money, and its results suggest that technological progress *does* make the price level more unstable in the face of e-technology shocks. The explanation for this effect is also very plausible: the smaller the amount of base money outstanding, the bigger the proportional impact of any given-sized shock.

There are some particularly alarming consequences for the United States:

> If the demand for base money in the United States becomes negligible, dollar prices in the United States would become entirely dependent on the foreign demand for U.S. currency, and the U.S. price level would become hostage to whatever (largely uncontrollable) factors influence the foreign demand for dollars. Any factors that reduce this demand—the successful remonetization of the former Soviet Union, which would lead citizens there to switch to local currencies; or the legalization of hard drugs, which would undercut much of the need to trade dollars in the black market—could then have devastating consequences for U.S. inflation. There is of course also the irony that the stability of the U.S. monetary system—and, hence, the health of the U.S. economy—would become very dependent on the activities of Colombian drug producers, Russian mafia, and other unsavoury elements [Dowd 1998: 329–30].

To avoid price-level instability, the central bank must reduce the supply of base money to match the fall in the demand for it. However, reducing the supply of base money is a difficult and historically unprecedented task. The central bank can only assess the demand for its own currency if it can also adequately model (and, more importantly, predict) the demand for its electronic competitor. The central bank would need a reliable econometric model of the demands for both types of currency, and this model would have to be robust enough to give reliable results in the face of potentially erratic technological changes—a tall order indeed, bearing in mind past problems with monetary forecasting, the potential difficulties posed by the famous Lucas critique of econometric policy evaluation (Lucas 1976), and the difficulties of forecasting the impact of future technological changes on the demands for conventional and electronic currency. The task of

managing down the currency supply to maintain reasonable price (or inflation) stability in the face of future technological progress is, to say the least, likely to be a difficult one.

Reducing the supply of base money would also create further problems for the central bank: since it would force the central bank to buy its own currency back, the revenue from money creation—its seigniorage—would become negative, and the central bank would start suffering major losses. The consequences for central banks would be extremely unpleasant and would, as Kenneth Rogoff put it, "take the shine off many central bank balance sheets" (Rogoff 1998: 2854; see also Selgin and White 2000: 30–31). The extent of central banks' vulnerability can be inferred from some figures presented by the Bank for International Settlements (BIS 1996). The BIS report estimates the fall in seigniorage revenue that individual central banks could absorb and still cover their operating costs. At one extreme, it estimates that the Federal Reserve could absorb a reduction of 93 percent in its seigniorage revenues and the Bank of England a fall of 89 percent. At the other extreme, the Banque de France could only absorb a reduction of 54 percent and the National Bank of Belgium only one of 62 percent. At face value, these calculations suggest that these central banks would be unable to cover their operating costs well before the demand for their currency fell to very low levels. They would therefore be able to continue in operation only if their governments were to intervene to cover their losses. This of course would do nothing for central banks' independence or their moral authority to instruct private-sector institutions on the need to bear their own losses. Those with a sense of history will certainly appreciate the irony.

In short, if reasonable price stability is to be maintained in the face of large falls in the public demand for base money, the resulting need to buy back the monetary base would cause major financial problems for central banks and drive many of them into insolvency.

Will the Demand for Base Money Disappear?

Given that cash is already in the process of losing the anonymity advantages it once had, it seems likely that further technological progress in the development of electronic payments media will eliminate any need for conventional cash within the foreseeable future. It is quite probable that the adoption of more efficient settlement procedures or a switch to fully private settlement procedures will also lead banks to close down their deposits with the central bank. We should

therefore really be asking whether there are any reasons *not* to expect base money to disappear.

The most commonly cited reason relates to the use of cash for illegal activities. The amount of cash used for such activity appears to be very large. In his recent study, Rogoff concludes that over half of the currency issued by OECD central banks is probably held in the OECD underground economy (Rogoff 1998: 288). This conclusion is supported by evidence that over 60 percent of OECD currency is held in the form of notes worth $100 or more, even though businesses and consumers have little use for very large notes. One could also argue that Rogoff's estimate must considerably understate the true amount of currency used in underground activities because a very large amount of OECD currency—perhaps 25–30 percent of the total OECD currency supply (Rogoff 1998: 261)—is used in underground economy transactions outside the OECD countries.

A partial response to the argument that people will always demand conventional cash for underground activities is that this demand depends to some extent on crime and tax policies in the countries in which particular currencies are held. For instance, the demand for U.S. dollars depends in part on the factors that determine the demand for cash in the underground economy in the United States and other countries where U.S. dollars are widely used. Consequently, the demand for currency for underground activities will fluctuate in response to changes in crime and tax policies in these countries, as well as other factors such as the level and state of general economic activity. A major liberalization of drug laws, for example, would presumably lead to a major fall in the demand for currency arising from drug trading. Drug dealers would be able to openly use bank accounts for their business activities, and so forth. Much the same effect would arise from reforms to legalize prostitution, cut tax burdens, and iron out inconsistencies in tax regimes. Such reforms would legalize activities that are currently illegal or reduce the incentive to engage in activities that were still illegal (e.g., moonlighting) and, either way, reduce the demand for cash for underground purposes.

Nonetheless, such reforms would only reduce rather than eliminate the demand for payments media arising from underground activities. However liberal the legal environment and enlightened the tax regime, there will always be some moonlighting and similar activities that give rise to an underground demand for transactions media. That said, there is no particular reason why the preferred payments medium should continue to be central bank cash. If cash ceases to be used for legal activities—say, because electronic media are generally better and cash loses any anonymity advantages it might still have—

then it is hard to see why it would continue to be used indefinitely for illegal ones. Conventional cash would lose its saleability and then be of no real use at all. After all, what is the point of moonlighters demanding to be paid in cash, if they can't spend it legally? The demand for cash for underground activities is thus ultimately dependent on the demand for cash for legal activities: if the latter disappears, then the former must disappear as well.[9]

Implications of the Demand for Base Money Falling to Zero

A demand for base money that approaches zero also creates further problems for our beleaguered central banks. Perhaps the main problem as the demand for base money gets very small is one discussed already—namely, that the price level is likely to become very vulnerable to shocks, and even more so as the demand for base money gets ever smaller. If the outstanding supply of base money has fallen, say, to $100 million then a shock that reduces the demand for base money by $1 million would lead, other things being equal, to an unexpected rise in prices of about 1 percent; when the supply of base money falls to $10 million, that same shock would lead to an unexpected rise in prices of 10 percent; when base money falls to $2 million, that shock would lead prices to rise by 50 percent; and when the supply of base money finally falls to $1 million, that shock would produce hyperinflation, as everyone rushes to get rid of their holdings of base money and its value plummets to nothing. The smaller the supply of base money, the greater the volatility of the price level. And even if the central bank is broadly successful in reducing the supply of base money to match the falling demand for it, there is likely to come a point where the price level becomes so volatile that the central bank can no longer maintain any reasonable degree of price-level stability in the face of the shocks that would occur.

If no measures were taken to anticipate it, the retirement of the last unit of base money from circulation would also create a further problem. It would deprive the economy of its nominal anchor—there would be no central bank instruments denominated in dollars that

[9]One might also argue that a demand for OECD central bank cash might continue in less developed countries after it had disappeared in the OECD countries, and we have no disagreement with this argument. However, we would expect the less developed countries to catch up eventually, and when they do, they too will abandon their demand for old OECD central bank currency. The issue therefore is not *whether* their demand for central bank cash will disappear, but rather *how long* it will take.

private parties could use as their unit of account. Nominal (i.e., dollar) prices would be indeterminate. Unless we (bizarrely) suppose that the economy would no longer need a common unit of account at that point, something would need to be done to ensure that the economy still had a common unit of account after base money had disappeared from circulation.

Policy Options

So what can central banks do to avoid, or at least mitigate, some of the consequences of a declining demand for base money? Broadly speaking, central banks (or the governments that back them) can respond in one or more of three ways: they can regulate or reregulate; they can compete; or they can abandon discretionary monetary policy altogether.

Regulatory Responses

The idea behind a regulatory response is to bolster artificially the demand for base money by imposing regulations that compel private parties to demand central bank money when they would otherwise demand less or none of it. For example, central banks could reimpose reserve requirements on bank deposits or impose such requirements against private-sector assets that were never subject to traditional reserve requirements (e.g., certificates of deposit, mutual fund shares, or general shareholdings). Governments might also (and typically do) require that private parties pay their taxes by means of checks written against deposits of central bank money. Any of these regulatory requirements would create some demand for central bank money provided there was still a demand for whatever it was that was subject to the regulatory requirement: a reserve requirement on bank deposits would ensure a demand for base money provided there was still a demand for bank deposits, and so on.

However, such regulatory requirements create costly distortions, and their effectiveness is increasingly doubtful. For instance, historical reserve requirements on checkable bank deposits put banks at a competitive disadvantage relative to nonbanks that offered checkable deposits, and put checkable deposits at banks at a disadvantage relative to noncheckable bank deposits. That said, such regulations no longer have the effect they once had. The competitiveness of modern financial markets and the easy availability of suitable (e.g., sweep) software make reserve requirements relatively easy to avoid. Customers affected by such requirements might also route their business

offshore or online where they could escape from them, and banks might do the same to escape from requirements on their settlement assets. Even the obligation to pay taxes in checks drawn against central bank money does not guarantee much of a demand for base money, because financial institutions can easily create temporary deposits or overdrafts of base money against which such checks can be written. Consequently, the effectiveness of measures to force people to hold base money must be doubtful.[10]

Competitive Responses

Central banks could also respond to the prospect of a declining demand for base money by becoming more competitive, and one way they could do so is by offering competitive interest on central bank deposits. In theory, such interest would encourage banks to maintain their deposits at the central bank. However, the payment of competitive interest on central bank deposits raises some tricky problems. In particular, if the rate of interest is genuinely competitive—neither too high nor too low—the demand for such deposits would become indeterminate and hard to predict. Worse still, the competitive payment of interest on deposits creates problems for monetary policy if the demand for central bank cash should disappear. If there is no demand for cash and the central bank pays competitive interest on its deposits, the central bank would no longer have any lever over the monetary system. Nominal prices and interest rates would become indeterminate, and the central bank would become a purely passive, rudderless agent with no influence over the monetary system. The competitive payment of interest is therefore only feasible if we can rely on there being some *other* source of demand for base money to tie down nominal values and interest rates and give the central bank some leverage over the system.

Central banks could also issue e-currency themselves, but this route too has its problems. The central bank would be engaging head-to-head with institutions that were better suited for commercial competition, so it is doubtful whether there would be any demand for its e-currency under competitive conditions. In any case, since the best it could reasonably hope for under such conditions would be to

[10]However, since it is also difficult to argue that any and all such measures would be *entirely* ineffective, they might at least ensure that the demand for central bank money did not disappear entirely, and this may prevent the disappearance of the economy's unit of account. Of course, what it might be worth, and how stable its value might be, are entirely different matters.

make a normal (i.e., competitive) profit, the launch of central bank e-currency would do little to improve a central bank's seigniorage. Of course, it can always resort to the practice of seeking to have legal restrictions imposed on its competitors (e.g., much as the demand for central-bank notes is bolstered by restrictions on private banknotes) or by securing other privileges for itself (e.g., such as the government stipulating that only central bank e-currency can be used to pay taxes). However, the effectiveness of such measures must be very doubtful, particularly given the expanding possibilities of e-technology and its usefulness in overcoming legal restrictions.

Abandoning Discretionary Monetary Policy

A third (and, we would argue, superior) response is for central banks to abandon discretionary monetary policy altogether and put the supply of central bank money on an automatic-pilot basis. There are many ways to do this, and one simple way is to peg the exchange rate. The central bank would stand ready to buy and sell its own currency on fixed terms against the currency to which its own was pegged. Unfortunately, this particular response will only 'work' to the extent that the central bank of the other country solves the same underlying problems. If a central bank pegs its currency to the dollar, it doesn't so much solve these problems itself as rely on the Federal Reserve to solve them for it. It hitches a ride with the Fed, and the degree of domestic price stability subsequently attained will depend to a large extent on the policies of the Federal Reserve. Whatever merits such a policy might have—and the central banks that peg their exchange rates may or may not regret doing so later on—such a policy still relies on someone somewhere grappling with the underlying issues (i.e., of a declining demand for central bank money). Even if all the other currencies peg to the dollar, for example, the Fed (or some group of leading central banks) must still come to terms with those issues or live with the consequences of not doing so.[11]

A better option is to restore a commodity standard, and there are a number of possible commodity standards to choose from. These include simple commodity standards in which the central bank pegs the value of the currency to a fixed amount of a specified commodity (e.g., a fixed amount of gold, as under a gold standard) and commodity-basket standards in which the central bank pegs the value of the

[11]A central bank could also participate in a currency union, but this option also still relies on someone else—in this case, presumably, the central bank of the new common currency— to address the same underlying problems.

currency to a fixed commodity-basket (see, e.g., Friedman 1951). A modern and more technically feasible version of the commodity-basket scheme is for the central bank to peg the price of a price-index derivatives contract, as in Dowd (1994). This type of scheme would also ensure a more stable price level than traditional commodity standards.

The restoration of a commodity standard would make the monetary system fully automated, and there would no longer be any scope (or need) for discretionary monetary policy decisions by the central bank.[12] The supply of central bank money would then obey the classic "law of reflux"—it would rise or fall automatically, in line with the public's demand to hold it. The supply of base money could then safely fall all the way to zero, if necessary, without any adverse consequences for inflation or price-level stability. The value of the currency would be protected, and there would be no danger of the economy's unit of account disappearing with the demand for central bank money.[13] What it would *not* do is protect the central bank from the losses it would suffer as the demand for its money falls away and the central bank buys back its currency from the public. However, we would argue that the central bank and the government should accept these losses gracefully and avoid any temptation to dodge them by inflating the currency. Put bluntly, it would be up to them as the beneficiaries of past seigniorage to honor their historical debts and pay up.

The Future of Central Banking

In depriving central banks of their role as managers of the monetary system, the restoration of a commodity standard also casts doubt on the future of central banking itself. Most central banks were established only in the last century, and the free-banking systems that preceded them have a long and distinguished historical record. As the

[12]An automatic monetary system would also avoid another problem with any discretionary, fiat money, system. This is the "decoupling" problem raised by Ben Friedman (2000): the likelihood that as e-technology develops further, the interest rate that the central bank could set would become "decoupled" from the market interest rates that matter for the macroeconomy. The danger of decoupling therefore reinforces the need to abandon discretionary monetary policy.

[13]In effect, the unit of account would be defined in terms of the good, service, or financial instrument whose price was pegged by the central bank's price-pegging rule, much as the gold-standard dollar was defined in terms of a fixed amount of gold. The unit of account, the dollar, would no longer be tied to the value of central bank currency as such, so the central bank currency could disappear without the unit of account disappearing with it.

Deputy Governor of the Bank of England, Mervyn King, recently wrote:

> Central banks may be at the peak of their power [but] . . . their extinction cannot be ruled out. Societies have managed without central banks in the past. They may well do so again in the future [King 1999: 3].

King is absolutely right, and we can only reiterate his advice to his fellow central bankers at their annual meeting in Jackson Hole in 1999 to "enjoy this marvellous symposium and live it as if it were our last" (quoted in Baker 1999: 3). Central banks cannot expect to live forever.

References

Baker, G. (1999) "Wall St. Asks Fed Questions—and May Hold the Answers." *Financial Times*, 31 August : 3.

Bank for International Settlements (1996) *Implications for Central Banks of the Development of Electronic Money*. Basle: Bank for International Settlements.

Boeschoten, W.C. (1998) "Cash Management, Payment Patterns and the Demand for Money." *De Economist* 146: 117–42.

Browne, F.X., and Cronin, D. (1995) "Payments Technologies, Financial Innovation, and Laissez-Faire Banking." *Cato Journal* 15: 101–16.

Browne, F.X., and Cronin, D. (1997) "Payment Technologies, Financial Innovation, and Laissez-Faire Banking: A Further Discussion of the Issues." In J.A. Dorn (ed.) *The Future of Money in the Information Age*, 153–65. Washington: Cato Institute.

Chaum, D. (1992) "Achieving Electronic Privacy." *Scientific American*, August: 96–101.

Dorn, J.A. (1998) "A New Monetary Universe." *The Freeman* 48: 657–59.

Dowd, K. (1994) "A Proposal to Eliminate Inflation." *Economic Journal* 104: 828–40.

Dowd, K. (1998) "Monetary Policy in the 21st Century: An Impossible Task?" *Cato Journal* 17: 327–31.

Dowd, K., and Cronin, D. (2000) "Electronic Currency and the Fiat-Money Price Level." Mimeo. Nottingham University Business School, and Central Bank of Ireland.

Freedman, C. (2000) "Monetary Policy Implementation: Past, Present and Future—Will Electronic Money Lead to the Eventual Demise of Central Banking?" *International Finance* 3: 211–27.

Friedman, B. (1999) "The Future of Monetary Policy: The Central Bank as an Army with Only a Signal Corps?" *International Finance* 2: 321–38.

Friedman, B. (2000) "Decoupling at the Margin: The Threat to Monetary Policy from the Electronic Revolution in Banking." *International Finance* 3: 261–72.

Friedman, M. (1951) "Commodity-Reserve Currency." *Journal of Political Economy* 59: 203–32.
Goodhart, C.A.E. (1986) "How Can Non-Interest-Bearing Assets Coexist with Safe Interest Bearing Assets?" *British Review of Economic Studies* 8: 1–12.
Goodhart, C.A.E. (2000) "Can Central Banking Survive the IT Revolution?" *International Finance* 3: 189–209.
Hancock, D., and Humphrey, D.B. (1998) "Payment Transactions, Instruments, and Systems: A Survey." *Journal of Banking and Finance* 21: 1573–1624.
Humphrey, D.B.; Pulley, L.B.; and Vesala, J.M. (1996) "Cash, Paper, and Electronic Payments: A Cross-Country Analysis." *Journal of Money, Credit and Banking* 28: 914–39.
Humphrey, D.B.; Pulley, L.B.; and Vesala, J.M. (2000) "The Check's in the Mail: Why the United States Lags in the Adoption of Cost-Saving Electronic Payments." *Journal of Financial Services Research* 17: 17–39.
Jordan, J.L., and Stevens, E.J. (1997) "Money in the 21st Century." In J.A. Dorn (ed.) *The Future of Money in the Information Age*, 115–26. Washington: Cato Institute.
King, M. (1999) "Credibility Test." *Financial Times*, 31 August: 3.
Krueger, M. (1999) "Towards a Moneyless World?" Department of Economics and Finance Working Paper No. 9916, University of Durham.
Lucas, R.E., Jr. (1976) "Econometric Policy Evaluation: A Critique." In K. Brunner and A.H. Meltzer (eds.) *The Phillips Curve and Labor Markets, Carnegie-Rochester Conference Series on Public Policy* 1: 19–45. Amsterdam: North Holland.
McCulloch, J.H. (1986) "Beyond the Historical Gold Standard." In C.D. Campbell and W.R. Dougan (eds.) *Alternative Monetary Regimes*, 73–81. Baltimore: Johns Hopkins University Press.
Rogoff, K. (1998) "Blessing or Curse? Foreign and Underground Demand for Euro Notes." *Economic Policy* (April): 263–303.
Selgin, G.A., and White, L.H. (2000) "Mengerian Perspectives on the Future of the Payments System." Mimeo. University of Georgia and University of Missouri-St. Louis, December.
Snellman, J.; Vesala, J.; and Humphrey, D. (2000) "Substitution of Noncash Payment Instruments for Cash in Europe." *Bank of Finland Discussion Papers*, 1/2000, Helsinki: Bank of Finland.
Timberlake, R.H., Jr. (1984) "The Central Banking Role of Clearinghouse Associations." *Journal of Money, Credit, and Banking* 16: 1–15.
White, L.H. (1987) "Accounting for Non-Interest-Bearing Currency: A Critique of the Legal Restrictions Theory of Money." *Journal of Money, Credit, and Banking* 19: 448–56.
White, L.H. (1995) *Free Banking in Britain: Theory, Experience, and Debate, 1800–1845*. 2nd ed. London: Institute of Economic Affairs.