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MONETARY POLICY IN ECONOMIES WITH LITTLE OR NO MONEY

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ABSTRACT

The paper's arguments include: (1) Medium-of-exchange money will not disappear in the foreseeable future, although the quantity of base money may continue to decline. (2) In economies with very little money (e.g., no currency but bank settlement balances at the central bank), monetary policy will be conducted much as at present by activist adjustment of overnight interest rates. Operating procedures will be different, however, with payment of interest on reserves likely to become the norm. (3) In economies without any money there can be no monetary policy. The relevant notion of a general price level concerns some index of prices in terms of a medium of account. The liabilities of some official entity might serve as the medium of account, but there could be viable rivals if policy is poor. (4) A broad commodity-bundle monetary standard could be viable, even with a redemption medium, and there is scope for quantitative analysis of the properties of such a system. (5) The number of distinct national currencies may decline sharply, with the emergence of a small number of currency areas and floating exchange rates across these areas.

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1. Introduction

This paper attempts to address issues relating to the topic of the conference session entitled "Money and Monetary Policy in the 21st Century." In that futuristic regard, probably the most prominent concern is that the continuing rapid development of information technology (IT) could lead to the disappearance of money as more IT-intensive methods for conducting transactions come to predominate. Closely related is the suggestion that central banks could lose the ability to influence aggregate demand and, therefore, inflation and cyclical macro-economic conditions. These topics lead on into other related concerns involving the unit-of-account role of money and exchange rate arrangements. Of particular interest are various proposals for an automatic, non-discretionary, commodity-bundle monetary standard. In what follows I will take up these issues and offer some analysis and opinions of my own.

2. Preliminaries

Before turning to the paper's main discussion, it will be useful to review some definitional matters and also two theoretical points. Terminologically, an economy's money is, by traditional usage, its tangible medium of exchange—i.e., an item that is generally acceptable in payment for any commodity.[1] Again by tradition, claims to some primary medium of exchange (MOE) are considered part of the money stock if they are convertible on demand. A monetary system of exchange is, accordingly, one in which the vast majority of transactions involve money on one side. A barter system of exchange, by contrast, is one in which commodities are directly exchanged without any intermediate conversion into money. Finally, an accounting system of exchange is one in which there is no money but exchanges are conducted by means of signals to an accounting network, with debits and

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credits to the wealth accounts of buyers and sellers being effected with each exchange. In the present paper, as in McCallum (1985), I will classify the latter type of system as non-monetary. In effect, an accounting system of exchange is a highly efficient form of barter.

Many writings emphasize that money typically serves in a second role, besides that as the MOE, as a "unit of account." Syntactically this usage is illogical, as noted by Wicksell (1935, p. 7) and Niehans (1978, p. 118), since money is a tangible object, not an intangible unit of measurement. What makes more sense is to distinguish the medium of account (MOA)—a particular commodity or commodity bundle—from the unit of account, which is some specified quantity of the MOA. Then the MOA is a good (or specified bundle of goods) some quantity of which serves as the basis for quoting prices in the economy under consideration. Thus, for example, from 1901-1932 the U.S. economy's MOA was gold whereas its unit of account (UOA) was a dollar, defined as 0.04838 ounces of gold. Since 1971, by contrast, the MOA for the United States has been Federal Reserve Notes (and claims to them), with one dollar serving as the UOA.

There is, as mentioned by Wicksell (1935) and Niehans (1978), and emphasized by McCallum (1985), no logical necessity for an economy's MOE to also be its MOA. But the computational benefits of having a MOA, which are sizeable, are incomplete unless the MOA is also the MOE. Accordingly, the MOE in a monetary economy will in most cases also be used as the MOA. In the absence of severe inflation or some other inducement to do otherwise, that is, sellers will quote prices in terms of the MOE. In other words, the MOE and MOA tend to coincide.

The first theoretical point to be mentioned is that private optimality considerations imply that if two assets are held in positive quantities and have equivalent risk

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[1] See, for example, Wicksell (1935) and Niehans (1978).

characteristics, then their marginal yields (rates of return) will be equal, when both pecuniary

and non-pecuniary returns are considered. In the much-discussed case of short-term

government securities and government sanctioned fiat money, for example, the rate of

interest on the security will equal the rate of interest paid on money (typically zero) plus the

marginal convenience yield provided by money due to its transaction-facilitating properties.[2]

An asset such as a working refrigerator can provide its owner with a lower rate of interest

than a paper security without being sold off, for another example, because of the services that

it provides. The same is true of a beautiful painting. If two assets have different risk

characteristics, this type of relationship will be modified so that the riskier asset will

command a somewhat higher marginal yield (relative to the other asset), but such

considerations can often be neglected when comparing the yields of short term government

securities and government provided paper money. For an extremely simple example of an

optimizing derivation of this type of marginal yield equality, see McCallum (2000b).

The second theoretical point involves the monetary transmission mechanism. In the

literature to be discussed, it is typically assumed that control over short-term nominal interest

rates is sufficient for monetary policy implementation. To begin with, if the central bank

controls an overnight rate, then a 25 basis point increase will induce an increase of nearly 25

basis points in other short-term rates, and these will induce increases in longer rates since the

latter are approximately equal to weighted averages of current and expected future short

rates. Then if the economy is one in which inflation rates are slow to adjust, changes in

nominal interest rates become changes in real interest rates, and these have real effects on

real aspects of cyclical economic activity (e.g., on real output and employment). But even if

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[2] Strictly speaking, one needs also to subtract the marginal service yield of the security; I am, as is often the case, assuming that yield to be zero.

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the economy is one in which prices adjust very rapidly, the interest rate changes will have an impact on nominal aggregate demand and make it possible for the central bank to control inflation in the economy. In what follows, this position—that control over short-term nominal interest rates is sufficient for central-bank management of macroeconomic policy—will be taken for granted.[3]

3. Economies with Very Little Money

Notable recent papers by Benjamin Friedman (1999) and Mervyn King (1999) have suggested that the ongoing improvement in information-processing technologies could lead in the foreseeable future to the near-disappearance of money and the possible loss of central bank control over aggregate demand. Reactions to these suggestions by Charles Goodhart (2000), Charles Freedman (2000), and Michael Woodford (2000) were featured in a special issue of International Finance, published in July 2000. A response by Friedman (2000) was also included, plus three papers on related but distinct topics by me, Richard Cooper, and Otmar Issing. Next, a long paper by Woodford (2001) and short comments by King (2001) and Robert Hall (2001) appeared in a 2001 conference volume from that year's Kansas City Fed symposium at Jackson Hole, Wyoming.   In addition, a set of papers on the topic appeared recently in a special issue of the New York Fed's Policy Review; these include articles by Woodford (2002), Marvin Goodfriend (2002), and Sandra Krieger (2002). In the following paragraphs I will attempt to outline the main contours of the argument while adding my own evaluation and thoughts at several points. In the present section the discussion will focus on Friedman's argument, which does not involve the complete disappearance of money but instead conjectures that its quantitative importance could

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[3] A few economists would disagree with this position, but that argument concerns a different set of issues than those discussed here.

diminish to the point that central banks would lose the ability to reliably influence aggregate demand.

Base money includes, of course, both currency and bank reserves. Friedman's argument focuses on the latter, presumably because of the standard central bank practice of passively accommodating currency demand. One part of Friedman's argument is that advances in IT make it possible for buyers to make payments by transfer of bank balances of a type that are not subject to reserve requirements or even by transfer of account balances held with non-bank organizations. The likely occurrence of such advances is evidently accepted by all participants in the debate, but Woodford argues convincingly that the magnitude of required reserves is irrelevant. After all, several central banks—including those of the United Kingdom, Sweden, Canada, New Zealand, and Australia—now operate successfully with systems that involve no reserve requirements. Overnight interest rates in these economies are controlled by means of "channel" arrangements, involving standing facilities that put both a floor and a ceiling on overnight rates.[4] These rates apply to reserve balances that banks hold with the central bank, not because reserves are legally required but because they are useful for settlement purposes (and to earn any interest that they pay).

Woodford's argument does not assume the existence of currency or reserve requirements so it applies quite generally, to any economy in which final payment settlements are mediated through balances held with the central bank (assuming that these balances serve as the MOA).[5] There is no necessity for currency to be used for transactions

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[4] The upper limit is established by the central bank's standing offer to make loans to any bank (with satisfactory collateral) at a rate that is (say) 25 basis points above the central bank's current rate target, while the lower limit comes from a standing offer to accept deposits from banks at a rate (say) 25 basis points below the target. See Woodford (2000, pp. 245-6).

[5] I am presuming that these balances should be considered the economy's MOE and therefore serve as its MOA (although the latter conclusion is not strictly implied).

or for non-bank firms to be excluded from supplying transaction accounts.

A related but alternative arrangement involves central bank payment of interest on reserves. This possibility is discussed by Woodford (2000, pp. 242-244, 254-255) and is treated extensively by Goodfriend (2002). If settlement reserves with the central bank are held by banks, along with overnight securities, then the interest rate on the latter will equal the sum of the interest rate paid on reserve balances plus the marginal service yield provided by these balances.[6] By adjusting the interest paid on reserves, then, the central bank can exert near-direct control over the overnight interest rate. The marginal service yield might adjust when the reserve rate is changed, but Goodfriend (2002, p. 78) points out that this complication can be eliminated if the central bank induces banks to hold reserves of such a large magnitude that the marginal (not average!) service yield has been driven down to zero (i.e., past the point of satiation). Then the overnight rate will adjust upward or downward point-for-point with the reserve-balance rate.[7] Goodfriend discusses several advantages, relative to current U.S. practice, of this approach to monetary policy implementation.

It is interesting and instructive to consider the feasibility of negative nominal interest rates on overnight loans under the interest on reserves setup. A negative rate on reserves is in principle possible—this amounts to levying a charge for holding settlement balances—and the sum of this rate plus a small marginal service yield can be negative. Thus the marginal equality of the previous paragraph seems to indicate that the overnight rate could be made significantly negative, and consequently that the payment of interest on reserves offers one approach for a central bank to conduct stabilization policy under conditions that call for

[6] Assuming, as before, that overnight securities provide no transaction-facilitating services.
[7] Note that the interest-on-reserves method of interest rate control does not require that there be no currency in the economy. If currency is held, then it will be held in sufficient amount that the marginal service yield of

negative nominal interest rates. The zero lower bound implied by this marginal equality is not a bound on nominal interest rates, but instead a bound on the difference between nominal interest rates on securities and on reserves.[8] This difference cannot go negative because it is equated, by optimizing asset holders, to the (nonnegative) real marginal service yield on settlement balances. The foregoing does not imply the possibility of significantly negative interest rates, however, if the economy is one in which currency (paying zero nominal interest) is held and used for transaction purposes. The reason is that another marginal equality also holds, one relating to overnight loans and currency. Since the interest rate on the former is equated, by optimizing asset holders, to the marginal service yield on currency, it can go negative only to the extent that the marginal service yield on currency can be driven negative. Presumably, however, this yield can be driven only a few basis points below zero—basically because storage of currency is very inexpensive; see McCallum (2000). Thus if the central bank made the interest rate on reserves strongly negative, their quantity would fall and overnight securities would cease to be held.

In the type of economy discussed to this point there exists some money. Currency may or may not be used for transactions by households or firms in general, but it is assumed that central bank settlement balances are used by banks and firms involved with final settlements. This transaction-facilitating money—central-bank settlement balances—serves both as a MOA and MOE. In the next section we move on to consideration of a more drastic case.

4. Economies with No Money

Specifically, we turn now to the more radical case discussed by King (1999, 2001).

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currency (which will be a decreasing function of the real quantity held) equals the overnight interest rate. (This statement presumes that no explicit interest is paid on currency.)

The presumption then is that IT advances become so extensive that "there is no demand for settlement balances at the central bank because final settlement can be provided by the private sector" (King, 2001, p. 379). Woodford (2001, pp. 254-259) argues that even in this case the central bank can control short-term interest rates by varying the rate of interest that it would pay on settlement balances kept at the central bank. In effect, the argument is that the overnight market rate will move together with the central bank's rate on reserves, as a result of the optimality condition for private asset holders that the overnight rate equals the reserve-balance rate plus the marginal service yield on reserves (with the latter equaling zero).[9] Goodfriend (2002, p. 81) reaches the same conclusion.

The just-mentioned equality is necessary for private optimality, however, only under the proviso that private asset holders choose positive quantities of both of the assets in question. While I do not doubt the argument of Freedman (2000) to the effect that in actual practice central banks will continue to be dominant providers of settlement services for the foreseeable future, in principle it could be that private suppliers would supplant central banks in this activity (if, say, some private supplier had better computer programmers).[10] And with respect to that (unrealistic) case I find one part of Woodford's argument to be unsatisfactory in principle. That part is the statement that "the unit of account in a purely fiat system is defined in terms of the liabilities of the central bank" (2000, p. 257). Certainly the liabilities of the central bank would be a leading contender for the role of MOA in an economy with no MOE, but there is no necessity that it be the one that prevails. Prices will, in a market economy, be quoted in terms of whatever medium most market participants find most

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[8] This is simultaneously the difference between the real rates on securities and reserves.
[9] This equality is a particular case of the marginal-yield condition discussed above.

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convenient. Just as central bank currency can be supplanted by some other MOE if its supply is managed too badly (e.g., under hyperinflation conditions), the central bank's contender for the MOA can conceivably lose out to another medium. And it is the unit of account actually prevailing in market transactions that is of macroeconomic importance; it is stickiness in terms of prices used in actual transactions that is relevant for the definition of real rates of interest that influence aggregate demand.[11]

In this regard, let us consider the statement of King (1999, pp. 48-49) in which he says that "the choice of a unit of account (perhaps a commodity standard, which would produce broad stability in the price level) would be a matter for public choice and regulation, along the lines of existing weights and measures …." Now, it is certainly correct that there are public-good or collective aspects to the designation of a unit of account, and that a well-managed official entry should easily win any competition to become the prevailing UOA. But if the national government designated the central bank's liabilities as the official UOA and the supply of these was mismanaged, it is possible that a privately provided commodity standard could supplant it. Specifically, it would be inconsistent with the principles of a market economy to have regulations forbidding the quotation of prices in terms of a unit of account other than one approved by some official body.

In any event, such an economy would be a non-monetary economy in the sense defined above. Thus there would be, strictly speaking, no monetary policy. Nevertheless

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[10] With respect to the realistic situation, Goodfriend's (2002) argument emphasizes that the central bank's role as provider of clearing services is thought to be contestable in practice largely because many central banks pay no interest on reserves, thereby taxing their own product whenever nominal rates are positive.

[11] In this discussion I am taking it for granted that the relevant concept of "price level" in a non-monetary economy is that implied by the MOA. In McCallum (2000a), it is suggested that the meaning of "price level" is questionable in an economy with no MOE.

there would be scope for different types of policy measures regarding price level behavior, with the price level being regarded as some general index of prices in terms of the UOA.

5. A Commodity-Bundle Monetary Standard

Let us consider, accordingly, King's (1999, p. 49) reference to a commodity-standard unit of account. His discussion continues as follows: "Only if the unit of account was [actively] managed would there be a role for a body such as a central bank. Whether the unit of account should be determined by a mechanical rule, as [with] other weights and measures, or managed in a discretionary way depends on some deep issues about the nature of "nominal rigidities" in such an economy." Here King is referring to the literature initiated by Black (1970), Fama (1980, 1983), Greenfield and Yeager (1983), Hall (1982, 1983), and Yeager (1983), which is critically reviewed in McCallum (1985). In several of these papers, and others that have followed, there is much emphasis on a commodity bundle chosen such that movements in its price would closely represent movements in a "general price level." It is argued by McCallum (1985) that Hall (1983) and Greenfield and Yeager (1983) are wrong in their suggestion that such a commodity bundle can be given MOA status by means of a simple, non-coercive <u>definition</u>. The suggestion in those papers is that if some official entity were merely to stipulate (non-coercively) that the value of one standard bundle might serve as the UOA, then there would be no need for any government (or private!) activity to enforce that definition in any manner. The mere definition would keep the price level, relevant for macroeconomic stability, constant over time, thereby ending problems both of inflation and inefficient cyclical variability.

It is my contention that this suggestion is too optimistic. One point is that viewing the designation of the unit of account as a pure convention, a matter of definition analogous

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to familiar definitions of units of length or time, is inappropriate. Thus the proper analogue

to the choice of a unit of length (e.g., the meter or yard) is the choice of units in which to

express quantities of the medium of account. It does not pertain to the choice of the

commodity or type of paper asset or type of accounting entry to serve as the medium of

account. Designation of the latter is not a matter of pure convention but instead a matter of

substantive importance (McCallum, 1985, pp. 37-38). It is true that given a MOA, the

designation of a UOA is innocuous, but the designation of a MOA is not; it is analogous to

the decision whether to measure the "size" of an object by its length, or height, or volume, or

mass.[12] In particular, if the economy is a monetary economy, even one with only a little

money, then the MOE will tend to be the MOA. And even if there is no MOE, about which

the authors in question are somewhat ambivalent, then a non-coercive designation of the

MOA would be extremely fragile, since the bookkeeping entries that serve as the MOA

would not be claims to actual bundles.

More substantively, however, I believe that a suitably modified version of the

Yeager-Greenfield scheme for monetary reform could in fact be viable.[13] To add to the

realism of the discussion, let us assume that there will be some central bank currency in use

and that this currency is the MOA, with "dollars" the UOA.[14] Now suppose that the central

bank seeks to keep the price of a broad standard bundle of goods and services constant at the

value P*. Next, suppose in addition that the central bank stood ready to exchange standard

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[12] For example, whether the UOA should be 0.04 or 0.01 grams of gold is innocuous, under the gold standard, but the choice of gold rather than silver (or copper or shells) as the standard commodity is not innocuous.
[13] The method to be discussed does not have the "laissez faire" aspects that Yeager and Greenfield desire. Accordingly, it is rather similar to the proposal of Irving Fisher (1913a, 1913b).
[14] Goodhart (2000) argues convincingly that currency will not disappear in the foreseeable future, in part because of the anonymity provided to its users.

bundles for currency, or electronic claims to currency, at par.[15] Then the dollar price of a

standard bundle could not depart significantly from P*. If the standard bundle were broad

enough as to represent "the price level," then price-level stability would be automatically

assured. The workings would be much like that of the gold standard, but the UOA price of a

broad bundle of goods, rather than of gold, would be stabilized.[16] For a central bank to

maintain stocks of a large variety of goods (and services?!?) would of course be difficult, so

Yeager (1985) and Yeager and Greenfield (1989) have stipulated that the central bank's

exchanges would not be conducted in terms of physical bundles, but instead in the form of

some redemption medium (e.g., gold or treasury bills) of equivalent value on current

markets. With this modification, and with operation by a government-appointed central bank

(or some alternative agency), the system would I believe be feasible and would keep the price

of the comprehensive bundle close to a constant par value.

It has been argued by Schnadt and Whittaker (1993, 1995) that the provision for

indirect convertibility (i.e., use of a redemption medium other than standard bundles

themselves) would render the system inoperable, as it would give rise to unlimited arbitrage

opportunities at the expense of the central bank. I believe that this difficulty, even if genuine,

can be overcome. Rather than enter into a discussion of the type pursued by Schnadt and

Whittaker (1993, 1995) and Greenfield, Woolsey, and Yeager (1995), however, I will

proceed by describing a system of the relevant type in a manner that is more closely related

to current mainstream policy analysis. Accordingly, let P_t be the dollar price in period t of a

standard bundle (i.e., the summed price of its components) and let P* be the constant target

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[15] Realistically, the central bank would have a standing commitment to sell bundles at $P^*(1 + \delta_1)$ and buy them at $P^*(1 - \delta_2)$, where δ_1 and δ_2 are some small positive numbers (e.g., 0.005).
[16] This arrangement is similar to the commodity-reserve money scheme of Milton Friedman (1951).

value for that bundle.[17] The central bank does not buy and sell bundles themselves, but attempts to peg the bundle's price by buying and selling units of a redemption medium. Let the dollar price in period t of one unit of this medium be PR_t. In each period, the central bank offers to buy and sell the redemption medium at a price that makes P_t approximately equal to P*, in light of the previous period's value of a standard bundle in terms of the redemption medium, P_{t-1}/PR_{t-1}. Thus the bank sets its period-t redemption-medium price at $PR_t = P^* PR_{t-1}/P_{t-1}$. So if $P_{t-1} > P^*$, then the central bank reduces the value at which it will buy or sell redemption units, relative to the value in period t-1, etc. Under this arrangement there is, I believe, no arbitrage possibility generated; the market price of the redemption medium in t will simply equal the value set by the central bank.[18]

An interesting and practical special case to consider is one in which one-period government securities ("bonds") serve as the redemption medium. Then if we normalize by assuming that each of bonds these sells in t for PR_t and is redeemed in t+1 for one dollar, the per-period rate of interest R_t on such securities is given by $1/PR_t = 1+R_t$. Substituting into the relation above, we obtain $(1+R_t)^{-1} = P^* (1+R_{t-1})^{-1}/P_{t-1}$. Taking logs and using the approximation $\log(1+z) = z$, we then have $R_t - R_{t-1} = p_{t-1} - p^*$, where $p_t = \log P_t$ and $p^* = \log P^*$. Thus we have a policy rule that calls for an increase (decrease) in the one-period nominal interest rate when the previous period's price level exceeds (falls short of) the target price level.

Now, the precise adjustment rule just given might not be optimal, in terms of keeping P_t close to P* and avoiding possible dynamic instability. But the exercise just conducted indicates that if there is any interest rate rule that satisfactorily stabilizes a price level around

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[17] There would be no analytical difference of any significance if we took P* to equal 1.0.

[18] The central bank could utilize a small spread, of the type mentioned above in footnote 16.

a constant target, then there is a corresponding rule for adjusting the buy-and-sell price of the redemption medium in a Yeager-Greenfield-type scheme, with short-term securities used as the redemption medium. The properties of such rules can be studied in macro/monetary models (with rational expectations, if desired) in the manner of today's standard monetary policy analysis, used for example in McCallum (2000b) and Woodford (2002b). Several questions remain, clearly, regarding a desirable form for the rule, the length of a period, the use of buy-sell spreads such as those defined above by δ_1 and δ_2, etc., but the outline for a method of studying these seems to be available. In particular, it should be possible to consider the issue of whether it would be better to have an automatic adjustment mechanism that keeps the price level as close as possible to some constant target, or alternatively to specify a somewhat gradual return toward the target after some shock has driven the price level away. In an economy with sticky prices, it is possible that a rule with prompt return would entail greater departures of output and employment quantities from their (efficient) flexible-price levels, depending on the specifics of the sticky-price mechanism at work.

6. International Exchange Rates

In conclusion, it seems appropriate to add a few words concerning exchange rate issues, since monetary policy and exchange rate management are intimately related. Indeed, while it is not quite true that they are simply different aspects of a single policy, that proposition comes closer to being true than the notion that they reflect two genuinely distinct macroeconomic policy tools. Indeed, from a long run perspective it is the case that monetary policy and exchange rate policy are but two aspects of one policy—for any stipulated pattern of behavior for a country's exchange rate can be accomplished only by subordinating monetary policy to that goal.

It is well known that during recent years professional opinion has moved toward the position that the only truly viable exchange rate regimes, for most countries, are either (i) a floating rate that leaves monetary policy available for assignment to domestic objectives or (ii) membership in a currency union with a common currency and a single monetary policy that is applicable to all members. This position reflects Milton Friedman's (1953) pioneering argument—i.e., that the self-destructive speculative inducements of a "fixed but adjustable exchange rate" make such a system worse than either extreme (i) or (ii)—and it also takes cognizance of actual experiences of the most recent decade in Europe, Asia, and South America. My own opinion is that this position is justified—see McCallum (1999)—and I do not expect that continuing developments in IT will overturn it during the next few decades. Such developments may push the world's optimal number of currencies somewhat closer to 1.0, but will not reach that limit.

Some writers have lumped single-nation currency board arrangements together with currency unions as representing a "hard fix" alternative to floating rates. But although currency boards represent a less precarious arrangement than that of traditional fixed-rate regimes, they are still open to abandonment when other policy objectives conflict with continued adherence to the currency's stipulated value. Hong Kong's experience has been mostly supportive of the currency board position, but the experience of others (e.g., Argentina) illustrates the dangers. Professor Ho's (2002) recent proposal, for a currency board that fixes not the exchange rate but the value of domestic currency in terms of a weighted average of goods prices in many nations, thereby representing a "world currency unit," would appear to provide a system that is less likely to yield exchange-rate

misalignments than a traditional currency-board setup.[19] Also, Ho's system takes account of

varying domestic macroeconomic conditions by making the domestic-currency value of the

world currency unit adjustable. One resulting problem with this system, if I understand it

correctly, is that it would imply that various "vintages" of the local currency would be in

circulation at the same time (i.e., would entail a non-unified currency).[20] This would be a

major drawback.

In any event, it seems likely that the coming decades will witness movement toward a

small number of regional currency unions, including the Euro area, a U.S. dollar area, a

possible Asian monetary union, and perhaps a few others. Within each union there would be

a single multi-national currency and a single monetary policy, with exchange rates across the

different unions floating rather freely. Such an evolution would require considerable

cooperation among nations, of course, and may not come to pass. But the example of Europe

suggests that the possibility is not inconceivable. If such a development were to take place,

then there would be heightened interest in specifying the role of national monetary

authorities within the various multi-national currency areas. A starting point for analysis of

several issues, relevant in this context, has recently been provided in a thoughtful paper by

Goodfriend (1999).

7. Conclusions

An extremely brief and non-nuanced statement of this paper's conclusions is as

follows. (1) Medium-of-exchange money will not totally disappear in the foreseeable future,

although the quantity of base money—currency and bank reserves—may continue to decline

in relation to the volume of economic activity. (2) In economies with very little money (e.g.,

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[19] The proposal also includes an adjustment to the target value of the currency, in terms of the basket, to account for cyclical fluctuations.

no currency but bank settlement balances at the central bank), monetary policy will be conducted much as at present by activist adjustment of overnight interest rates. Operating procedures will be different, however, for some economies including the United States. Payment of interest on reserves is likely to become the norm. (3) In economies without any money there can be no monetary policy, of course. The relevant notion of a general price level concerns some index of prices in terms of a medium of account. Theoretical considerations suggest that the liabilities of some official entity such as a central bank might serve as the medium of account, but there could be viable rivals especially if policy does not generate stability of prices in terms of these liabilities. (4) Arguments for a broad commodity-bundle monetary standard should be of considerable interest. Such an arrangement could be viable, even with a redemption medium that differs from the standard commodity bundle, and there is scope for quantitative analysis of the properties of such a system. (5) It seems possible that the number of distinct national currencies will decline sharply, with the emergence of a small number of currency areas within each of which there is a single currency and a unified monetary policy. Exchange rates across these areas are in this case likely to float fairly freely.

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[20] These different vintages would result from adjustments of the type mentioned in the previous footnote.

References

Black, Fischer (1970) "Banking and Interest Rates in a World Without Money,"

      Journal of Bank Research 1, 9-20.

_____ (1987) "A Gold Standard with Double Feedback and Near Zero Reserves,"

      Business Cycles and Equilibrium. Basil Blackwell, Inc.

Fama, Eugene F. (1980) "Banking in the Theory of Finance," Journal of Monetary

      Economics 6, 39-57.

_____ (1983) "Financial Intermediation and Price Level Control, Journal of

      Monetary Economics 12, 7-28.

Fisher, Irving (1913a) "A Compensated Dollar," Quarterly Journal of Economics 27, 213-

      235.

_____ (1913b) The Purchasing Power of Money, 2nd edition. Macmillan.

Freedman, Charles (2000) "Monetary Policy Implementation: Past, Present and Future—Will

      Electronic Money Lead to the Eventual Demise of Central Banking?" International

      Finance 3, 211-227.

Friedman, Benjamin (1999) "The Future of Monetary Policy: The Central Bank as an Army

      with Only a Signal Corps?" International Finance 2, 321-338.

_____ (2000) "Decoupling at the Margin: The Threat to Monetary Policy from

      the Electronic Revolution in Banking," International Finance 3, 261-272.

Friedman, Milton (1951) "Commodity-Reserve Currency," Journal of Political Economy 59,

      203-232.

_____ (1953) "The Case for Flexible Exchange Rates," in Essays in Positive

      Economics, by M. Friedman. University of Chicago Press.

Goodfriend, Marvin (1999) "The Role of a Regional Bank in a System of Central Banks," Carnegie-Rochester Conference Series on Public Policy 51, 51-71.

_____ (2000) "Overcoming the Zero Bound on Interest Rate Policy," Journal of Money, Credit, and Banking 32, 1007-1035.

_____ (2002) "Interest on Reserves and Monetary Policy," Federal Reserve Bank of New York Economic Policy Review 8, 77-84.

Goodhart, Charles (2000) "Can Central Banking Survive the IT Revolution?" International Finance 3, 189-209.

Greenfield, Robert L., and Leland B. Yeager (1983) "A Laissez Faire Approach to Monetary Stability," Journal of Money, Credit, and Banking 15, 302-315.

Greenfield, Robert L., W. William Woolsey, and Leland B. Yeager (1995) "Is Indirect Convertibility Impossible?" Journal of Money, Credit, and Banking 27, 293-297.

Hall, Robert E. (1982) "Explorations in the Gold Standard and Related Policies for Stabilizing the Dollar," in Inflation, ed. by R.E. Hall. Univ. of Chicago Press.

_____ (1983) "Optimal Fiduciary Monetary Systems," Journal of Monetary Economics 12, 33-50.

Ho, Lok Sang (2002) "A WCU-Based Currency Board as a Sustainable Exchange Rate Regime," Working Paper, Lingnan University, Hong Kong.

King, Mervyn A. (1999) "Challenges for Monetary Policy: Old and New," New Challenges for Monetary Policy. Federal Reserve Bank of Kansas City.

_____ (2001) "Commentary," Economic Policy for the Information Economy. Federal Reserve Bank of Kansas City.

Krieger, Sandra C. (2002) "Recent Trends in Monetary Policy Implementation: A View

 From the Desk," Federal Reserve Bank of New York Economic Policy Review 8,

 73-76.

McCallum, Bennett T. (1985) "Bank Regulation, Accounting Systems of Exchange, and the

 Unit of Account: A Critical Review," Carnegie-Rochester Conference Series on

 Public Series 23, 13-45.

_____ (1999) "Theoretical Issues Pertaining to Monetary Unions,"

 NBER WP 7393. Forthcoming in Monetary Unions Conference, ed. by Forrest

 Capie and Geoffrey Wood. Macmillan Press.

_____ (2000a) "The Present and Future of Monetary Policy Rules,"

 International Finance 3, 273-286.

_____ (2000b) "Theoretical Analysis Regarding a Zero Lower Bound on

 Nominal Interest Rates," Journal of Money, Credit, and Banking 32, 870-904.

Niehans, Jürg (1978) The Theory of Money. Johns Hopkins University Press.

Schnadt, Norbert, and John Whittaker (1993) "Inflation-Proof Currency? The Feasibility of

 Variable Commodity Standards," Journal of Money, Credit, and Banking 25, 214-21.

_____ (1995) "Is Direct Convertibility Impossible? A Reply"

 Journal of Money, Credit, and Banking 27, 297-298.

Wicksell, Knut (1935) Lectures on Political Economy, Vol. 2. Routledge & Kegan Paul.

Woodford, Michael (1998) "Doing Without Money: Controlling Inflation in a Post-

 Monetary World," Review of Economic Dynamics 1, 173-219.

_____ (2000) "Monetary Policy in a World Without Money," International

 Finance 3, 229-260.

_____ (2001) "Monetary Policy in the Information Economy," <u>Economic</u>

<u>Policy for the Information Economy</u>. Federal Reserve Bank of Kansas City.

_____ (2002a) "Financial Market Efficiency and the Effectiveness of Monetary

Policy," Federal Reserve Bank of New York <u>Policy Review</u> 8, 85-94.

_____ (2002b) <u>Interest and Prices</u>. Princeton: Princeton University Press,

forthcoming.

Yeager, Leland B. (1983) "Stable Money and Free-Market Currencies," <u>Cato Journal</u> 3, 305-

326.

_____ (1985) "Deregulation and Monetary Reform," <u>American Economic</u>

<u>Review Papers and Proceedings</u> 75, 103-107.

Yeager, Leland B., and Robert L. Greenfield (1989) "Can Monetary Disequilibrium be

Eliminated?" <u>Cato Journal</u> 9, 405-421.