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Competitive Payments Systems and the Unit of Account

By LAWRENCE H. WHITE*

Recent competitive innovations in payment mechanisms, particularly the checkable money market mutual fund, seem to have blurred the edges of the category of assets properly called "money." These innovations have coincided with new attempts by economists to reconstruct monetary theory and policy using competitive models. Several authors have conceived of competitive payments systems seemingly devoid of any outside currency, base money, or standard medium of exchange.¹ The unit of account in these systems is evidently not a common currency unit established outside the banking industry. Yet it can be argued that the use of a common unit of account in decentralized economic calculation presupposes a general medium of exchange.

Lance Girton and Don Roper have recently written: "One observes that most contractual obligations are specified in terms of the units in which the medium of exchange is measured. Further research should provide more insight into why contracts are specified in units in which the medium of exchange is measured" (1981, p. 20). This paper attempts to provide some insight into this question. By examining whether the above-mentioned cashless competitive payments systems are coherent and operational, it explores the fundamental relationship of the unit of

account to the medium of exchange. It specifically examines the plausibility of competition divorcing the unit in which prices are specified (the unit of account) from the medium in which payment is typically made. The argument concludes that a payments system not based on convertibility into an outside currency should not be expected to arise in the absence of government intervention.

I. Cashless Competitive Payments Systems: A Brief Survey

A. *Black*

The belief that unrestricted competition would produce a payments mechanism devoid of outside money is expressed already in the title of Fischer Black's 1970 article, "Banking and Interest Rates in a World Without Money: The Effects of Uncontrolled Banking." Black claims that in the world he imagines "money in the usual sense would not exist" (p. 9). Initially he assumes that no currency is used; later he allows for currency, but supposes that its nominal quantity will be purely demand-determined, so that it does not serve as an outside money forming a base for bank liabilities.² Payments are made by transfer of this currency and bank liabilities. No mention is made of the redeemability of bank liabilities for this currency or any basic physical monetary asset produced outside the banking industry. I will for brevity's sake refer to such an asset as "outside currency" or "cash."

What serves as the unit of account? Black cannot say "the currency unit," for that is supposed to be subsidiary to the unit in which bank liabilities are denominated. Instead he says: "Goods may be priced in

²Currency in this world is supposed to be issued by the government, but only on request of the banks, in exchange for reduction of government debt with the banks. For criticism, see fn. 16 below.

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¹Fischer Black (1970), Eugene Fama (1980; 1982), Robert Hall (1981; 1982a,b), Robert Greenfield and Leland Yeager (1983). At the other extreme, F. A. Hayek (1978) and Benjamin Klein (1974) have conceived of a great multiplicity of parallel base monies and standards. Criticism of the latter models is left implicit in what follows.

terms of a unit of account that does not fluctuate in value very much, and means of payment may be priced in terms of the same unit of account" (1970, p. 14). The unit of account in Black's world is clearly not an outside currency unit as it is in our world. It is instead apparently a unit of a distinct numeraire commodity (or bundle of commodities) that does not itself serve as the means of payment. This is indicated by the remark that the means of payment is to be *priced* in terms of the unit of account rather than the unit of account being *defined* in terms of the means of payment. Thus Black's system divorces the unit of account from the characteristic units of the system's exchange media.

It is not at all clear in terms of what numeraire commodity the unit of account would be defined in Black's world, or how that numeraire would be selected. He conducts a thought experiment in which the means of payment successively assumes five forms: 1) barter; 2) shares of common stock; 3) corporate bonds; 4) corporate bonds certified by "banks"; 5) pure bank liabilities. The passage quoted above appears in his discussion of the second stage. There it was clear that the hypothesized unit of account was not the characteristic unit of the hypothesized means of payment (a share of a stock portfolio). At no later state is this divorce mended.

The logic of Black's construction receives fuller criticism below. But the following curious feature of Black's exposition deserves mention here. He speaks of "the dollar price" of a medium-of-exchange unit and "the dollar price" of a commodity, with "the dollar" clearly intended to designate the unit of account. He suggests that transactors in his system may use these "dollar" prices for the purpose of computing a commodity's price in terms of the medium of exchange. Yet there is nothing called "dollars" actually being traded against the commodities in the system, hence no mechanism for registering the prices of those commodities in terms of dollars. There are no dollar prices established on markets logically or temporally prior to establishment of medium-of-ex-

change prices.³ The problem here is not that the unit of account is divorced from the medium of exchange, but that it is totally abstract, divorced from any traded good. Such an abstract unit of account, as Don Patinkin indicates (1965, p. 16), can have no operational significance for market participants. It can be meaningful only to a Walrasian auctioneer or other outside observer.

B. Fama

Black's article went uncited in the literature for a decade, until the appearance of Eugene Fama's "Banking in the Theory of Finance."⁴ Fama, like Black, considers outside money inessential to the competitive payments mechanism he hypothesizes. He posits a "pure accounting system of exchange" (p. 42) in which the function of banks is to operate "a system of accounts in which transfers of wealth are carried out with bookkeeping entries" (p. 39). This method of wealth transfer is asserted to be "entirely different" in relevant respects from the use of cash. Fama claims that the transactions industry in the world he examines can dispense entirely with cash: "An accounting system works through bookkeeping entries, debits and credits, which do not require any physical medium or the concept of money" (p. 39). This means that in Fama's world, as in Black's, bank liabilities need not constitute claims to cash: "In a pure accounting system of exchange, the notion of a physical medium or temporary abode of purchasing power disappears" (p. 42).

Unlike Black, Fama is explicit in stipulating that the unit of account in his world should be thought of as the unit of a commodity that plays no medium-of-exchange role: "it could well be tons of fresh cut beef or barrels of crude oil" (p. 43). He explicitly recognizes that bank "deposits"—which would be heterogeneous, being essen-

³I am indebted to Robert Greenfield for this point.

⁴This result of a search through the literature (by Fama) was personally reported to me by Bob Hall. It evidently excludes self-citations by Black.

tially shares in various mutual funds and not claims to a common currency—are not a suitable candidate for numeraire.

Prices of commodities are stated in terms of the numeraire. Fama recognizes that an economy of this sort “is basically non-monetary.” There is no question of price-level determination: since there is no money commodity trading against other goods, there is no money price level. There are only numeraire or relative prices to be determined. The determination of relative prices is apparently to be thought of as a performance of the Walrasian auctioneer. Fama speaks of the system posing “a standard problem concerning the existence of a stable general equilibrium in a non-monetary system” (1980, p. 44).

Like Black, Fama leaves the particular numeraire commodity (“some real good”) and its method of selection both unspecified. This is of no concern so long as we take the auctioneer construct seriously. The auctioneer’s choice of a numeraire is of no consequence. But Fama implicitly slips out of this construct. He suggests that agents in his world face genuine calculational problems, and that they deal with one another in decentralized markets rather than with the auctioneer alone. He says of the accounting system of exchange, for instance, that “its efficiency is improved when all prices are stated in units of a common numeraire” (1980, p. 43).

After analyzing banking in a nonmonetary setting, Fama introduces currency in the form of “a non-interest-bearing fiat currency produced monopolistically by the government” (1980, p. 50). The unit in which currency is measured may then serve as the economy’s numeraire. The real value of a currency unit in terms of goods and services is determined in familiar fashion, as a determinate demand for real currency balances confronts a fixed nominal stock of currency.

Fama suggests that banks in the world with currency provide a “currency convertibility service” for their customers. But it is unclear whether he means “convertibility” in the usual sense of an obligation to *redeem* deposits on demand for outside currency.

Banks taking on such an obligation have an inventory demand to hold currency as reserves against stochastic redemption outflows.⁵ Limitation of the quantity of reserve currency available to the banks then limits the quantity of deposits that banks can prudently create. Fama states that banks would indeed “inventory currency on behalf of depositors” (1980, p. 50), but at the same time implicitly denies that the banks of an unregulated system would hold any non-interest-bearing reserves. Yet a bank’s vault cash should be considered the primary component of its reserves where its deposits are convertible in the usual sense of constituting sight claims to predetermined quantities of currency.⁶ By “convertibility,” Fama must mean only that the banks act in the manner of money market mutual funds. Bank liabilities in his analysis are not claims to outside currency, as they are today, but are on the order of shares in a mutual fund’s portfolio of interest-bearing assets. These funds (or Fama’s “banks”) stand ready to liquidate their shares (his “deposits”) on demand by selling the assets to which the deposits constitute a claim and then turning over the proceeds to the shareholder (“depositor”). Fama is explicit in a more recent paper that this is what he envisions. He states that in his world: “Deposits are just claims against other claims (securities, loans, etc.)” (1982, p. 6). That is, they are not redeemable claims to outside currency. Fama’s propositions that “deposits issued competitively should not be called money” and that “the concept of

⁵See Ernst Baltensperger (1980, pp. 4–6). In the competitive banking system of Scotland prior to 1844, to give a historical example, banks held positive quantities of specie as reserves against redemptions of liabilities despite the absence of reserve requirements and despite the fact, consistent with Fama’s hypothesis of how a competitive system would operate, that the banks settled claims among themselves by transfer of readily marketable interest-bearing assets, namely Exchequer bills. On this episode, see my 1984 book, ch. 2.

⁶By “predetermined” I do not mean that deposit interest rates never vary, but that rates are contractually set before the period to which they apply. They are not calculated afterwards based on portfolio performance, as in the case of mutual fund shares. For further discussion, see Section IIIA below.

money plays no role in the transactions services accessed through deposits" (1982, p. 7) both rest on deposits not being claims to outside currency. The significance of the difference between such assets and deposits in the usual sense is explored below.

It is clear from the "parable" with which Fama concludes his earlier article (1980, pp. 55–56) that he regards the existence of outside money as unnecessary for the operation of an accounting system of exchange. Outside money is to him simply one commodity that, if it exists, may serve as numeraire; however, there is no need for it to exist. Steel ingots or spaceship permits may as well serve as numeraire. This result is arguably not true of any plausible world. There are compelling reasons, discussed below, for outside money to exist and to serve as the unit of account.

C. Hall

In two recent papers Robert Hall, searching for monetary policies consistent with stable prices and full deregulation of banking and financial markets, has questioned the necessity and desirability of associating the unit of account with a medium-of-exchange currency unit. Citing Fama (1980), Hall states: "It is possible to define the monetary unit [the unit of account] as one unit of a resource called currency, but this is only one of many different definitions" (1981, p. 4). In general the unit is simply "a certain amount of some resource" specified by government; the resource need not be currency. As an example of a noncurrency monetary unit, Hall proposes "defining" the dollar in terms of a composite-commodity unit called the *ANCAP*, consisting of specified physical quantities of ammonium nitrate, copper, aluminum, and plywood. Beyond defining the dollar in such a way, government is to play no role in the payments industry.

The *ANCAP* unit was chosen by Hall for its stable purchasing power over the last thirty years. Presumably this stability was measured in terms of some price index. An obvious question therefore arises: why does Hall not suggest defining the dollar directly in terms of the commodity bundle making up the price index he desires to stabilize? The answer lies in the mechanism he im-

PLICITLY relies on for tying the value of the unit-of-account dollar to the specified commodity bundle. Only the commodity bundle is to be legal tender for dollar obligations. This means that all holders of contractual claims to receive dollars (or of obligations to pay dollars) are entitled to demand (or make) payment in the physical commodities defining the dollar. Any sufficiently wide divergence between the market price of the standard commodity bundle and one dollar will trigger demands by creditors to receive commodities rather than paper dollars (or deliveries by debtors of commodities in place of paper dollars). Transactors choosing to contract in *ANCAP* dollars would be exposing themselves to the risk of being forced to deliver, or to accept delivery of, physical bundles of the standard commodities. Every transactor would be taking on bank-like obligations. It is natural to doubt that many transactors would voluntarily do so. An *ANCAP* obligation seems to be clearly dominated for both creditor and debtor by an obligation indexed to the *ANCAP* bundle but contractually payable in a common medium of exchange, that is, explicitly ruling out the commodity-delivery possibility, given that a common medium of exchange is by definition more readily accepted than other commodities. The creditor would rather receive, and the debtor rather pay, readily spendable money than a bundle of commodities of equal market value. It is less implausible to suppose that specialized bank-like institutions might issue *ANCAP*-redeemable obligations. The question that then arises, to be answered below, is whether such obligations would gain currency in an unregulated environment.

D. Greenfield and Yeager

A recent paper by Robert Greenfield and Leland Yeager attempts to elaborate more explicitly the possible operation of a competitive mutual-funds-type payments system devoid of outside money. They attribute the inspiration behind the cashless competitive payments system to the three authors whose works I have just surveyed. In Greenfield and Yeager's view of that world, bank-like mutual funds would develop and operate a

sophisticated barter system (pp. 305–08). The unit of account would be an arbitrarily chosen numeraire bundle of commodities; the means of payment would be primarily shares of ownership in mutual fund portfolios. They explicitly affirm both the nonexistence of any outside money in which funds' liabilities are redeemable and the divorce of the unit of account from these media of exchange.

Greenfield and Yeager do not examine the question of whether such a system could emerge or survive under competitive conditions. They do consider whether the system's unit of account "has operational meaning" and whether "the level of prices expressed in that unit is determinate" (p. 313). In both cases, they find in the affirmative. But this merely means that they find the concept of keeping track of relative prices by use of a numeraire unit not incoherent or self-contradictory. It remains to be considered whether economic agents in an unregulated world without a central auctioneer would be likely to converge on use of a unit of account that is not a unit of outside currency.

II. Competitive Payments Systems in Evolutionary Perspective

In past and present monetary systems of our world, the generally accepted media of exchange have been and are units of outside money and inside-money claims to outside money. Inside money is naturally denominated in units of the cash to which it is a claim, as each banknote or bank deposit is a claim to a particular number of units of outside money. The distinguishing feature of outside money is that it does not constitute a redeemable claim to any physical asset. Whatever may be the bookkeeping conventions with regard to the issue of fiat money, as a form of outside money it is not in actual fact a contractual debt liability of any agent or institution. The world has known both commodity outside money—gold and silver coins provide the most familiar example—and fiat outside money. The latter typically originated as monopoly issued inside money whose redeemability was suspended after it had gained currency. In all cases the outside monetary unit naturally functions as the unit of account. This is because prices are natu-

rally quoted in the units of the solitary item (or set of items, identically denominated because secondary members of the set are claims to a primary member) whose payment will routinely be accepted in exchange.

To mount a critique of cashless payments systems, one must give reasons for the emergence and prevalence of outside money as a generally accepted medium of exchange and unit of account. The reasons given here delve back to the origins of money.

A. *The Origin of Commodity Money*

The classic invisible hand explanation of the emergence of money from an initial state of barter was given by Carl Menger (1982). Under barter, each agent, attempting to transform his initial endowment into his desired final consumption bundle through direct exchange, confronts the problem of finding a second agent who both offers for sale what the first wishes to buy and is willing to accept in payment what the first has to sell. The typical agent can achieve his goal more economically if, instead of searching for this rare or even nonexistent match, he exchanges his endowment for more widely acceptable commodities that he may in turn readily exchange for the goods he ultimately wishes to consume. Accordingly he accumulates a trading inventory of highly saleable items. These allow him to economize on search costs by raising the probability that he may, in any given number of samplings among sellers, make desired purchases. In this situation the superior saleability of certain items becomes self-reinforcing: the knowledge that other traders will accept an item with high probability raises its acceptability to each particular trader. A network of traders will therefore converge on one or a small number of items as general media of exchange. Their supreme saleability then distinguishes these items from all other commodities. They have spontaneously become money.⁷ Historically gold and silver emerged as money in eco-

⁷For a modern version of this theory, see Robert Jones (1976). See also Ludwig von Mises (1971, pp. 30–34). Menger defines "saleability" more or less as the narrowness of the effective bid-ask spread, but construes this broadly to include spatial and temporal dimensions.

nomically advanced nations through this process.

It should be readily apparent by extension of this perspective on the origin of money that a unit of account emerges together with and wedded to a medium of exchange. A seller pursues his self-interest by posting prices in terms of the media of exchange he is routinely willing to accept. This practice economizes on time spent in negotiation over what commodities are acceptable in payment and at what rate of exchange. More importantly, it economizes on the information necessary for the buyer's and the seller's economic calculation. Posting prices in terms of a numeraire commodity not routinely accepted in payment, by contrast, would force buyer and seller to know and agree upon the numeraire price of the payment media due. This numeraire price of the payment medium would naturally be subject to fluctuation, so that updated information would be necessary. A non-exchange-medium numeraire commodity would furthermore be subject to greater bid-ask spreads in barter against other commodities, as by hypothesis it is less saleable, than the medium of exchange. It would therefore serve less well as a tool of economic calculation.

It is worth emphasizing, as Menger emphasized with respect to the genesis of a general medium of exchange, that a collective decision is in no way necessary for the emergence of a clearly defined common unit of account. This point seems to have escaped those authors who consider monetary units to be the creatures of government proclamations.

B. Coinage

The evolution of monetary institutions does not, of course, stop with the emergence of commodity money. One may trace out further steps that take place in an unregulated competitive environment. Supposing that gold has emerged as primary money, the next logical step is economization of the costs of using the metal in transactions accomplished by the institution of coinage. Coined metal enjoys greater acceptability than uncoined metal (for example, gold dust)

due to the lower cost of determining its true bullion content. The ease of authentication is still further enhanced by the institution of brand names in minting: once a mint's products are trusted to be of the weight and fineness stated on their face, its coins may pass by tale. Transactors may then forego weighing and assaying each piece of metal tendered in payment. The demand for readily authenticated pieces of gold will therefore give rise to a market in minting services. Each mint strives to maintain a reputation for uniformly high quality, lest it lose customers to its rivals by imposing higher authentication costs.⁸ In competitive equilibrium, the mintage fee will be just sufficient to earn each minter the normal rate of return on investment. Self-interest will lead all mints in an economy to denominate coins in terms of a unit of standard weight and fineness. A mint doing otherwise would inconvenience its customers. The precise definition of the unit is itself unimportant; it may be based on preexisting custom in measuring the bullion content of uncoined gold, or it may be adopted from the coinage of an early reputable mint. This unit then serves as the unit of account.

Competitive private minting industries have been comparatively rare historically. Governments have typically monopolized the supply of minting services. In a noncompetitive situation, where debased government-issued coins circulate, the bullion content of an earlier full-weight coin may continue to serve as unit of account though no existing coin measures up to that content. This is the phenomenon of "ghost money," which is sometimes misleadingly cited as an example of divorce between the unit of account and

⁸For examples of this process at work in the United States, where some three dozen private mints operated in the gold rush regions of the nineteenth century, see Donald Kagin (1981). Black (1972, p. 811) inaccurately identifies privately minted coins as a form of inside money. Armen Alchian's (1977) account of the selection of a commodity money relies solely on economization of authentication costs. In my view, this explains the emergence of standardized forms of money, but as far as the origin of money itself goes is subsidiary to economization of search costs through holding of highly saleable commodities. Easy authentication is simply one among several properties contributing to ready saleability.

the medium of exchange.⁹ In fact, the unit of account and the medium of exchange both continue to be quantities of gold. The unit-of-account value of any particular coin in circulation is a question of its weight and fineness, not of variable market exchange rates. The unit of account and medium of exchange have not become distinct commodities, only distinct quantities of the same commodity. The informational difficulties posed by a non-payment-medium numeraire, whose exchange value may vary in terms of payment media, do not arise. The minor inconvenience that does arise may be attributed to the absence of competitive conditions. Under competitive conditions, a debasing mint would find that money users reject its products in favor of full-weight coins.

C. *Bank Liabilities*

The emergence of precious metals as money, and subsequently of coins as their common form, comes about in a free economy as the undesigned outcome of decentralized pursuit of self-interest. The genesis of inside monies may be similarly explained. Bank liabilities originate as claims to specie deposited with bankers (hence the term deposits; Fama's use of this term to denote money market fund shares is misleading). In medieval Italy the first bankers were money changers; in London they were goldsmiths.

Claims to specie assume a monetary character when bankers discover profit in the business of effecting the payments one depositor wishes to make to another by direct transfer of bank balances from the one to the other. Checks are today the common means of signalling the bank to perform a transfer of balances, but the emergence of paperless electronic means would do nothing to change

⁹On "ghost monies," see Carlo Cipolla (1956, ch. 4). The misleading claim that these represent abstract units of account is made by Patinkin (p. 15). While it is true that a ghost money unit had no exact counterpart among existing coins, each of these coins bore a fixed value relationship to the unit based on relative bullion content. For purposes of pricing and calculation, the situation was similar in kind to that prevailing today in the Italian monetary system, where no one-lira coin or note circulates.

the essential nature of the transaction. Banknotes—claims to bank specie transferable without bank intervention and payable to the bearer on demand—similarly emerge as a means of payment.¹⁰ Banknotes naturally find the greatest acceptance when denominated as round multiples of the specie unit that has previously become the standard unit of account. Money users find each form of redeemable claim to bank specie more economical to use for many purposes than actual specie. Bankers are recompensed for providing these instruments by the interest they earn on assets corresponding to the fraction of their liabilities not matched by specie on their balance sheets, or (in the case of deposits) by direct fees for the transfer service. In an unregulated system, the banks pay competitive rates of interest on their deposits. Due to the costliness of doing so, they are unlikely to pay interest on their notes.¹¹

An invisible hand process can be shown (see my book, pp. 19–22) to account for the emergence of an interbank clearinghouse in a competitive banking system. Briefly, each member of a pair of banks profitably enhances the moneyness of its notes and deposits relative to specie by agreeing to accept one another's notes and deposits at face value as tendered by customers for deposit or loan repayment. Mutual acceptance of liabilities is naturally accompanied by an arrangement for periodic settlement of the claims each bank collects against the other. The potential gains from these pairwise arrangements are not exhausted until all banking companies in a region belong to a single clearinghouse system.

Members of the clearinghouse will, in the absence of regulation, be able to economize on specie shipments by settling balances partly through the transfer of highly marketable interest-bearing assets. Specie redeemability remains essential to the economical functioning of the mutual acceptance ar-

¹⁰On the early history of European banking, see Raymond de Roover (1956, ch. 5).

¹¹See my book (pp. 8–9). Fama (1982, pp. 14–15) comes to the same conclusion for currency that is not a claim to outside money. Note that today's traveler's checks do not bear interest.

agement, however, as the means by which all bank liabilities have their value fixed in terms of the unit of account. The acceptance of their notes at fixed par values spares banks' customers—and the banks themselves—exchange risk and calculational inconvenience, and is therefore integral to the function of acceptance arrangements in enhancing the moneyness of the participating banks' liabilities.

A competitive banking system of the following sort thus emerges in the absence of regulation. The stock of exchange media consists of specie in the hands of the public plus numerous brands of redeemable banknotes plus transferable bank deposits. The self-interest of issuers insures that notes circulate at par, that is, at unit-of-account values fully equal to the number of specie units to which they are claims.¹² Transferable deposits bear a competitive rate of interest, subject to competitive charges for transfer services. The nominal quantities of specie, notes, and transferable deposits held by the public are determined not by any central bank regulation of the monetary base, but by the real demand to hold those assets divided by the purchasing power of specie. Each bank's holdings of specie reserves are determined by its equating at the margin the cost of foregone interest to the benefit of reduced risk of illiquidity. Total specie reserves are simply a summation of these holdings across banks.¹³

The transition from a specie-based competitive banking system to a fiat-currency-based system is most readily made in two steps: government creation of a central bank, whose specie-redeemable liabilities displace specie as a commercial bank reserve asset; and suspension of redeemability for central bank liabilities. The supply of banking

services may continue to be competitive, but the nominal quantity of money is now scaled to central bank determination of the monetary base.

Note what happens to the unit of account in the transition to fiat money. At no point does it cease to be defined in units of the basic outside-money medium of exchange. The status of basic medium of exchange, however, passes from specie alone to a straddle between specie and a redeemable central bank currency denominated in specie units (dollars, pounds sterling, etc.), then to the no-longer-redeemable central bank currency (still bearing the same name) alone. In this way the economy arrives at a situation in which a noncommodity outside money has positive exchange value. Paper money is able to function as the basic medium of exchange because it previously functioned as a secondary medium of exchange.¹⁴

III. Cashless Competitive Payments Systems: Critique

In light of the evolution of money and banking, the problem confronting models of noncurrency-based payments systems is clear. Their applicability for modeling current institutions or predicting future arrangements awaits a coherent account of how a cashless system is consistent with or might emerge from the currency-based payments systems the world has known. This is not to deny that such models may serve to illuminate the monetary institutions of our world by contrast to the abstraction of a world without outside money. This is a use to which Greenfield and Yeager deliberately put their model. It is a role Fama may also have in mind, as he later introduces outside currency to his model after first abstracting from it. In a way, the models play this role in the present discussion: I hope to illuminate the importance of the causal-genetic processes behind monetary institutions, particularly the unit of account, by contrast to models seemingly inconsistent with these processes.

¹⁴This historical account may explain the fact that intrinsically useless fiat money has positive value more plausibly than the overlapping generations model of fiat money. For that model, see Neil Wallace (1980).

¹²That banknotes fell below par when they crossed state borders—reflecting risk and transportation costs of accomplishing redemption—in the American “free banking” era was due to the legal prohibition on interstate branch banking. In the freer Scottish system, no such inconvenience was experienced.

¹³This system is spelled out in my book (ch. 1). The statement of marginal conditions in the text assumes equal marginal operating costs of holding various assets. The basic paradigm of bank optimization is set forth by Baltensperger.

A. *The Disappearance of Demand Deposits*

Could a monetary system based on outside currency (specie or fiat currency) spontaneously evolve into a cashless competitive payments system of the sort envisioned by Black, Fama, and Greenfield-Yeager? Three steps are necessary to make the transition: 1) disappearance of redeemable inside money; 2) disappearance of outside money; and 3) redefinition of the unit of account in terms of a numeraire other than outside money. This section considers the first of these steps. For expositional convenience it focuses on demand deposits, though in the past banknotes have also been important as inside money. The term inside money here denotes ready claims to outside currency. These are distinct from shares in a managed portfolio of assets.

Fama envisions a world in which “competitive unregulated banks provide a wide variety of portfolios against which depositors can hold claims” (1982, p. 15). Bank deposits no longer constitute claims to cash, in other words, but are instead akin to transferable shares in mutual funds and hence “can be tailored to have the characteristics of any form of marketable wealth” (Fama, 1980, p. 43). Fama unfortunately fails to show that the outcome of unregulated competition would be the total domination of interest-bearing demand deposits by mutual fund shares. In fact this outcome is unlikely, even apart from the question of which can provide payments services more efficiently. Demand deposits, being ready debt claims, are potentially superior to mutual fund shares, which are equity claims, in at least one respect. The value of a deposit may be contractually guaranteed to increase over time at a preannounced rate of interest. Its unit-of-account value at a future date is certain so long as the bank continues to honor its obligation to redeem its deposits on demand. No such contractual guarantee may be made with respect to an equity claim. A mutual fund is obligated to pay out after the fact its actual earnings, so that the yield on fund shares cannot be predetermined. In the absence of deposit rate ceiling regulation, the range of anticipated possible returns from holding

fund shares need not lie entirely above the deposit interest rate. Risk-diversifying portfolio owners might therefore not divest themselves entirely of demand deposits even given a higher mean yield on mutual funds. It is true that the characteristic pledge of money market mutual funds to maintain a fixed share price, or rather the policy of investing exclusively in short-term highly reputable securities so that the pledge can be kept, makes fund shares akin to demand deposits in having near-zero risk of negative nominal yield over any period. The difference between predetermined and postdetermined yields—between debt and equity—nonetheless remains. The historical fact is that deposit banking did not naturally grow up on an equity basis.¹⁵

The more important reason why demand deposits would survive even under unregulated competition is that the payments system they provide is, given the conditions that lead to the emergence of money, less costly. This cost differential is suggested by the fact that a checkable money market fund today typically imposes a \$500 minimum on checks written against shares in the fund. The comparative costliness of check writing against money market funds in their present form arises from the fact that checks written against a fund require it either 1) to incur the transactions costs of selling securities plus the cost of transmitting the receipts to the payee, or 2), what is presumably less costly and the method actually used, to draw against a demand deposit with a commercial bank held as one of the fund’s assets.¹⁶ In the latter case, it is evident that effecting a payment by writing a check against a fund, which in turn draws down its demand deposit, must be more costly than directly

¹⁵Though there was medieval banking in which bank deposits were treated as equity claims, this treatment was devised to evade church and state prohibitions against the payment of interest on debt. Again see de Roover (pp. 201–02).

¹⁶All funds whose prospectuses I have examined hold a small percentage of their assets (less than 1 percent) in the form of a demand deposit with a commercial bank for the purpose of honoring redemption checks (and purchasing securities).

effecting the payment by writing a check against the payer's own demand deposit. In the present world the checkable money market fund rides piggyback upon the banking system.

The check writing feature of money market mutual funds relies on a money-transfer system for the obvious reason that sellers of commodities generally wish to be paid in money and not in other assets. Checks written on a money market fund are generally acceptable in payment only because to the recipient they represent a transfer of inside money, that is, of cash-redeemable bank deposits. Its unique acceptability as a routine means of payment is, as we have seen, an essential property conferred on money by the Mengerian convergence process that engenders money. Every form of marketable wealth could serve generally as a medium of exchange only in a world where all forms of wealth begin and remain equally marketable. Outside a Walrasian general equilibrium setting, this is difficult to imagine.

There are no obstacles in principle to the spontaneous emergence of an interfund clearing system that does not rely on transfers of inside money. If mutual funds really could provide payments services efficiently, it would be natural to expect money market funds in the present system, unless prevented by law, to begin announcing bilateral or multilateral arrangements to permit check writing in any amount for purposes of transferring wealth to accounts in participating funds. By this device, each participating fund would enhance the spendability and hence desirability of its shares relative to nonparticipating shares and demand deposits. As yet this has not happened. At present, money market funds rarely allow check writing for unlimitedly small amounts, even for transfer of shares to another customer of the same fund. This is difficult to reconcile with the idea that fund shares are so routinely acceptable that they could dominate inside money as a means of payment.

This argument does not rule out mutual funds developing a money-transfer system and allowing cash withdrawals, or what would be identical, banks offering checkable mutual fund accounts with direct access to

an interbank clearing mechanism. The analytical question in this case—why money-transfer and cash-inventory services should be jointly produced with deposits at lower cost than with mutual fund shares—awaits further research. But it seems clear that the major impetus to the use of mutual funds for check writing purposes, a use negligible before 1974, has been Regulation Q's prohibition of competitive interest rates on checkable bank deposits. With this ceiling largely lifted, the rationale for joining money-transfer services to mutual funds has largely disappeared.¹⁷

In a model competitive payments system devoid of cash or genuine demand deposits, payments effected via check writing against fund shares obviously do not work by transfers of money. Instead a check written against Fund *A* in favor of a customer of Fund *B* is supposed to occasion a transfer of nonmonetary assets from Fund *A* to Fund *B* via a clearing arrangement (Greenfield-Yeager, p. 307). These two funds must have previously entered a mutual acceptance arrangement of the sort (described earlier) arising in a free banking system. The clearing mechanism has to be slightly different, however, in the following respect. Fund *B*, in accepting checks written on Fund *A*, does not possess a claim to Fund *A*'s vault cash of a specific quantity. Instead Fund *B* possesses a claim to Fund *A*'s assets of a specific value. Checks are written, and interbank clearing balances computed in units of account, as at present. But a check no longer transfers a claim to so many physical units of outside currency; it instead transfers ownership of earning assets with a market value of so much. The interfund clearing arrangement has to specify

¹⁷Two caveats are in order. 1) The 1982 Garn-St. Germain Act authorizing Super NOW accounts (checking accounts with no legal interest ceiling) denies these accounts to business firms, leaving firms a reason for using money market fund or sweep accounts for check writing. 2) So long as demand deposits are in effect taxed by the imposition of reserve requirements, there remains a rationale for hybrid accounts. The reason why money market mutual funds (like banks) do not price their money-transfer services explicitly may be found in the taxation of explicit interest but nontaxation of gratuitous services.

what types of assets are acceptable in settlement of adverse balances. So does an interbank clearing arrangement if it is to economize on physical transfers of non-interest bearing currency, of course, but this does not reduce its reliance on cash redeemability as the means by which the unit-of-account value of bank liabilities is fixed and their general acceptability maintained.

An apparent disadvantage of bank deposits in the form of ready claims to predetermined quantities of currency, in contrast to fund shares, is the possibility that a bank might become insolvent and thereby unable to honor all the claims presented to it for redemption. (Illiquidity is no greater problem for a bank than for a mutual fund that allows check writing and cash withdrawals.) A mutual fund cannot become insolvent: as it issues no liabilities in the strict sense, but only equities, it cannot have liabilities in excess of its assets. A money market fund can legally break its pledge to maintain a fixed share price if a sharp fall in the value of its assets makes a reduction necessary. A bank lacks the flexibility to reduce its deposit liabilities in a similar way without going into bankruptcy. In a *laissez-faire* monetary system, bank deposits would not be government insured. Depositor fears of insolvency might be adequately addressed, however, by high capital-asset ratios, by private deposit insurance, by forms of organization giving the bank's stockholders extended personal liability for its debts, or by some other means.¹⁸ Hence it is not obvious that checkable mutual funds would dominate demand deposits on grounds of lesser risk. The debt form of deposits does insulate depositors from sharing in portfolio losses that leave equity positive.

The difference between demand deposits and fund shares, and the plausible nondisappearance of the former under freely competitive conditions, requires the revision of several propositions put forth by Fama (1982, pp. 2-8). 1) While outside currency and fund

shares are indeed not perfect substitutes whose supplies may with any obvious sense be aggregated, and while outside currency and demand deposits are also not perfect substitutes, demand deposits (and banknotes) may sensibly be aggregated with outside currency held by the nonbank public in a measure of the quantity of money. The econometric use of this aggregate is a separate question. 2) The supply of demand deposits will likely be important in the determination of the price level for a closed economy with a competitive unregulated banking system. Even if the determination of the price level in that economy is most appropriately modeled in terms of the supply and demand for outside money alone, demand deposits are presumably a close substitute on the demand side. 3) The concept of money clearly does play a role in the transactions services made available through demand deposits. 4) A bank using the clearing mechanism of an unregulated banking system holds claims against the cash reserves of other banks, not against their portfolios.¹⁹

B. *The Disappearance of Outside Money*

Might outside money disappear with the evolution of competitive payments mechanisms? This boils down to the question of the disappearance of outside currency. In the present American banking system, the deposits of member banks with the Federal Reserve may be regarded as a form of outside money (though they are claims to Federal Reserve notes, their quantity is not regulated by the existing quantity of those notes). This form of outside money is an artifact of regulation, however; in an unregulated banking system with a private clearing mechanism and no central bank, outside currency (say, specie or fiat currency) would be the only form of outside money.

The authors whose models have been considered here all recognize that currency will continue in use so long as manual transfer of

¹⁸Unlimited liability was a feature of the Scottish free banking system. Depositors' losses due to bank insolvencies were completely negligible, as failures were rare and the losses fell upon shareholders.

¹⁹Only the last of these sentences rectifies an incorrect statement Fama makes about a banking system. The others contrast a banking system to his characterization of a payments system operated by mutual funds.

currency remains the least costly method for accomplishing certain transactions. Not only is currency 1) more convenient to use in small payments, but 2) its acceptance, unlike acceptance of personal checks, entails no risk that the payer's funds may be insufficient, and 3) its use leaves behind no possibly incriminating records of payment. These authors all think it coherent, however, to suppose that all currency is inside currency. Pieces of such currency would be akin to banknotes, except that they would constitute claims against the portfolios of the issuing funds rather than claims to cash.²⁰

Cashlessness has an important implication. Bonds in the cashless world cannot be what they are in our world, claims to future streams of money payments. They must rather be claims to future payments of commodities or to other financial assets. These other financial assets must be equities or shares in a mutual fund portfolio of equities, as it would be circular for bonds to be exclusively claims to other bonds, either directly or indirectly via money market fund shares in bond portfolios. The present value of bonds in the cashless world must then be the discounted value of the commodities or equities to be received in future payments. This clearly would make bond pricing much more difficult than it is in our world were the future payments to be defined in units of the commodities or equities to be paid. Greenfield and Yeager understandably suggest that the quantity of payment property (as they call it, p. 313) to be received would be specified, like all other contractual payments, in numeraire value units rather than in the physical own-units of the property. Coupon payments would proceed in commodities or equities of specified worth in terms of the

numeraire. The bondholder nonetheless receives payment in commodities or equities. In general he will wish to sell these rather than hold his wealth in their form, so that he will prefer bonds whose coupon payments are made in the most readily saleable form of property. In our world the most saleable property is money; in the cashless world it is supposed to be shares in mutual fund bond portfolios. But this, as I have noted, creates a circularity problem. Hence one of two outcomes is possible: either bondholders are saddled with relatively high transactions costs in unloading payment property, or bond portfolio shares are not the dominant means of payment. In the latter case, say where shares in a mutual fund portfolio of common stocks were instead the dominant means of payment, the numeraire value of exchange-medium holdings would clearly be subject to significant fluctuation.

The natural question to ask from an evolutionary perspective is whether there is any plausible reason for outside currency to disappear in a payments system freed from anticompetitive regulation. I have explained above that the emergence of particular commodities as money is not wholly accidental, but a consequence of their superior saleability. Black (1970, p. 14) hypothesizes the use of shares of a portfolio of common stock as money, that is, as a generally accepted medium of exchange. There are good reasons, however, to doubt that such an item would ever become the most saleable in an economy. The primary reason is that the institution of common stock is unlikely to arise in a premonetary economy because the division of labor it presupposes would not exist there. Even were stock shares to emerge in a barter economy, it is difficult to conceive of their being more saleable than the most widely saleable of commodities. Arising in an already monetized economy (this is Black's scenario), shares of stock are from the outset routinely sold against money and not against any other good. They lack the saleability of money. And this inferior saleability is self-reinforcing: no trader routinely accepts shares of stock or shares of a portfolio of stocks when he cannot expect to be able to spend them easily. Each trader finds the use

²⁰Fama (1982, pp. 9–11) and Greenfield-Yeager (pp. 307–08) clearly envision currency issued exclusively by mutual funds. Black (1970, pp. 13–14) introduces government-issued currency, but erroneously believes that the nominal quantity of this currency will be endogenously determined. He apparently fails to see or denies that an excess of supply of government currency at a given level of prices will be worked off through a rise in prices, not through retirement of the excess currency. In another paper (1972), Black advances a doctrine of the passivity of outside money.

of shares an inefficient medium of exchange due to high information and search costs. The "inefficiencies" of commodity money cited by Black would exceed the inefficiencies of common stock money only in a world in which common stock approached the saleability of commodity money.

For analogous reasons it should be apparent that a commodity reserve currency system, in which the basic money is redeemable for a basket of nonmonetary commodities, would not arise spontaneously in an unregulated setting. A claim to a basket of commodities would not originally emerge as money, since in a barter setting it would be less saleable than the most saleable of its components. Nor would it supplant the original monetary commodity. This is not to deny, however, that one money (say, silver or domestic fiat currency) may be spontaneously supplanted by another (say, gold or foreign fiat currency) in a region where both have been circulating internally, or where external trade with neighboring regions is conducted in their different money. A switch may come about because the transactions conducted in the second money grow in relative importance, or because the first money experiences an exogenously caused ongoing relative decline in purchasing power.

C. The Divorce of the Unit of Account from the Medium of Exchange

For reasons already suggested, a unit of account emerges wedded to a general medium of exchange. Prices are universally posted in the characteristic units of a medium or set of media that sellers are routinely prepared to accept in exchange. This process is self-reinforcing: a buyer or seller who communicated bid or ask offers in nonstandard units would impose calculation costs on potential trading partners. For this reason the unit of account remains wedded to the medium of exchange.

In an inflationary environment it is certainly possible for a unit of stable purchasing power to displace the depreciating currency unit as the unit of account voluntarily adopted in contracts calling for payments at future dates. An example of a stable unit would be the "constant dollar" defined by a

base-year price index. There is no tendency for spot prices to be indexed in this way, however. Indeed the perpetuation of non-indexed spot prices is presupposed by indexing, which uses current nominal prices to compute the current-dollar equivalent of a constant-dollar sum.

The unit of account sticks with the medium of exchange even through the transition from commodity-based to fiat currency. A historical example is instructive here. In the suspension period of the Napoleonic Wars, 1797–1819 in Britain, Bank of England notes and deposits became the basic outside money.²¹ Gold coins ceased to circulate. The unit of account, the pound sterling, stuck with the actual medium of exchange rather than with a now-abstract gold definition. The pounds-sterling price of gold fluctuated rather than the pounds-sterling price of Bank of England notes. Commodity prices rose with the expansion of Bank of England notes and deposits, while the unit-of-account value of a banknote or deposit remained fixed.

IV. Conclusion

In a decentralized and unregulated economy in which all property is not equally saleable, outside money emerges as most the saleable commodity and persists as a general medium of exchange. Inside monies arise and persist on the basis of their convertibility into outside money. The characteristic unit of outside money naturally defines the unit of account, as prices are naturally posted by traders in terms of the item sellers will routinely accept in payment.

In a Walrasian world where the auctioneer renders all commodities equally saleable, and therefore equally suitable for use in indirect exchange, payment in any commodity could be accepted indifferently. Tatonnement may proceed without outside money. Any commodity or bundle of commodities could serve as unit of account, the auctioneer's choice of a unit of account being unconstrained by any economic considerations. The payments

²¹ Technically they were not fiat money since resumption at a later date was both anticipated and realized. In von Mises' (p. 483) terminology they were credit money.

system appropriate for such a world, however, is inappropriate in the present world of decentralized trade involving goods of unequal marketability. The convenience of traders in the present world dictates outside money whose units define the unit of account. Deregulation of the payments system in the present world does not imply disappearance of outside money, nor divorce of the unit of account from the basic outside-money medium of exchange.

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