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BANK DEREGULATION, ACCOUNTING SYSTEMS OF
EXCHANGE, AND THE UNIT OF ACCOUNT:
A CRITICAL REVIEW

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ABSTRACT

This paper reviews a specific group of recent publications by Black, Fama, Hall, and Greenfield and Yeager that (i) encourage the relaxation of government controls on the banking industry, (ii) emphasize the possibility of an economy in which most transactions are carried out through an accounting system rather than any tangible medium of exchange, and (iii) suggest that improved monetary performance could be induced by separating the unit of account from the medium of exchange. The main substantive conclusions are as follows. First, a system with an unregulated banking sector and a government-issued currency would be viable and might reduce inefficiencies resulting from reserve requirements, a point that has been recognized by neoclassical monetary economists. The second main class of systems discussed in the reviewed papers--one with a composite-commodity medium of account and no convertibility provision--is quite different. If there were literally no medium of exchange, the non-coercive government designation of the unit of account would encounter no inconsistency but would be extremely fragile. More realistically, with some circulating private currency the latter would tend to become the medium of account as well as the medium of exchange and would tend to be issued in excess, thereby separating the unit of account from the officially-designated bundle of commodities. Several conclusions regarding analytical approach are also developed.

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I. Introduction

Events of recent years--including actual macroeconomic experiences as well as professional developments--have induced a substantial quantity of research on the fundamentals of monetary economics. One interesting and provocative line of work emphasizes the conceptual possibility of a technologically advanced economy in which most transactions are carried out not by means of a tangible medium of exchange but by access to an accounting system for effecting wealth transfers via bookkeeping entries. The main published contributions--which include papers by Black (1970), Fama (1980) (1983), Hall (1982a) (1983), Greenfield and Yeager (1983) and Yeager (1983)--strongly encourage the relaxation of government controls on the banking industry and exhibit considerable interest in the idea that improved monetary performance could be induced by adoption of a new, non-monetary unit of account. The purpose of the present paper is to review and critically assess the main ideas in this body of literature.

A minor problem that arises immediately involves the appropriate way to refer to the collection of writings in question. Hall (1982a) (1982b) speaks of a "new school of monetary economics," but that designation lacks descriptive content and leaves unclear what school is referred to and when it was new. There is thus the possibility of confusing this group with the proponents of the "New View" of banking developed in the 1960's under the leadership of Gurley and Shaw (1960) and Tobin (1963).¹ Greenfield and Yeager (1983) refer to the "BFH system," with the initials pertaining to Black, Fama, and Hall. This too seems inappropriate, since the system in question is actually the creation of Greenfield and Yeager, but leads one naturally to think of designating the group as the "BFH school." That term is not without its own flaws--in particular, it ignores the contribution of Greenfield and Yeager and simply presumes that it is appropriate to refer to the relevant collection of writers as a "school"--but I will nevertheless utilize it occasionally, in places in which some such label is hard to avoid.

In any event, a striking feature of the work of the group--whatever its designation--is its tendency to be more antagonistic to government regulation in the area of money and banking than are proponents of the doctrine of monetarism, a tendency that is somewhat ironic in that

the leading monetarists (i.e., Friedman, Brunner, Meltzer) have long been regarded by much of the profession as laissez faire extremists. In fact, according to Hall (1982b), the BFH school is strongly critical of some of the most basic tenets of monetarism. Thus "the new monetary economics views the quantity theory as nothing more than an artifact of government regulation" (Hall 1982b, p. 1552) while "the money stock itself is a creature of inefficient regulation" (p. 1555). Black (1970) voices some similarly anti-monetarist suggestions, such as the following: "As soon as we get to a world where payments are made by transferring deposits and notes, the quantity theory becomes impossible even to formulate" (1970, p. 19). And even Fama, whose position is less radical, expresses rather strongly some views that appear hard to reconcile with monetarist traditions. One example is provided by his suggestion that "the banking system is best understood without the mischief introduced by the concept of money" (1980, p. 44).² One object of my discussion, accordingly, will be to consider the extent to which disagreement between the BFH school and monetarists is logically implied by different theoretical and/or empirical beliefs, and the extent to which it is instead the result of misinterpretation of the other group's position.

Brief mention should be made at the outset of two previous papers that provide critical consideration of the literature in question. The first of these is Fischer's (1983) useful presentation of his own "Framework for Monetary and Banking Analysis," which touches upon several of the topics considered below. There is very little attempt in Fischer's paper to comment specifically upon claims of the BFH school, however, and some of its distinctive propositions are not carefully examined.³ The second of these papers is a very recent article by White (1984), which is explicitly concerned with the BFH literature but mainly with regard to a single issue, viz., the possibility of a divorce of the unit of account and medium of exchange. White's treatment, moreover, is more historical in emphasis than the one developed below. It thus provides a useful complement, which I shall draw upon in a few places.

It should also be mentioned that, in their attitude toward deregulation, the BFH writings display a notable element of similarity with the "competitive currencies" proposals of Klein

(1974), Saving (1976), Hayek (1978), Vaubel (1978), and others. There is, however, a moderately clear distinction between the two groups provided by the BFH emphasis on accounting (as opposed to monetary) exchange and by the floating-rate aspect of the various currencies in the other group; for an elaboration on these differences the reader is referred to Yeager (1983). The present paper does not attempt to survey or analyze the competitive currencies literature.

II. Preliminaries

Before turning to a description of the literature items themselves, it will be useful to go over a few preliminary matters. One purpose of doing this is simply to settle on some terminological conventions pertaining to the notion of a unit of account. The conventions emphasize, however, a distinction that is often neglected and which should be helpful in preventing misunderstanding in what follows. An additional purpose is to describe a substantive proposition concerning the unit of account that will be utilized in an important way in the discussion of Sections III and VI.

The most fundamental of the relevant terminological distinctions pertains to the type of payments system utilized in an economy for effecting exchanges. The three main types of payments systems are ones emphasizing barter exchange, monetary exchange, and accounting exchange. Money is, by traditional definition, a tangible medium of exchange, i.e., an asset that is generally acceptable in payment for any commodity. A monetary payments system is, then, one in which the vast majority of transactions involve money on one side.⁴ This contrasts with a barter system of exchange, in which commodities are directly exchanged--without the benefit of the monetary intermediary--when the "double coincidence of wants" is satisfied. In an economy with an accounting system of exchange, finally, there is no tangible money but the inconvenience of barter is nevertheless avoided; transactions are effected by means of signals to an accounting network, with these signals resulting in appropriate credits and debits to the wealth accounts of sellers and buyers.⁵ Actual economies will, of course, feature some exchanges of each type. But for the topics of concern in this paper, it will be convenient to have pure systems of these three types in mind. Economies with barter and accounting systems are not, according to our terminology, monetary economies.

It is often said that money typically serves in an additional role, as a unit of account. As Wicksell (1935) and Niehans (1978) have noted, this is unfortunate terminology since "money" is a tangible object (a commodity or a paper asset), not a conventional unit of measurement. Somewhat more appealing is the terminology proposed by Niehans (1978, p. 118)

whereby the unit of account (e.g., dollars or ounces) is a specified quantity of the asset that serves as the medium of account (e.g., Federal Reserve notes or gold).⁶ An obvious alternative is to use the term numeraire to refer to the asset, some unit of which serves as the unit of account.⁷ This term is sometimes utilized, however, to refer to the good that is the basis for relative prices as expressed by the economic analyst, not as the basis for prices as stated by sellers in the economy itself.⁸ In order to be definite with respect to this distinction, I will use Niehans' term in what follows: the medium of account is a good (or collection of goods) some unit of which is used as the base for prices quoted by sellers in the economy under study.

The foregoing discussion provides a reminder that there is no logical necessity for an economy's medium of account (MOA) and its medium of exchange (MOE) to be the same. Once that is recognized it must be admitted that, as Fischer (1983, p. 8) has remarked, there is nothing in most monetary analyses bearing on the determination of the identity of the MOA. But having admitted that, it is important also to recognize that in a monetary economy the benefits of having a common unit of account are incomplete unless the MOA is also the MOE. This point, which is made explicitly by Niehans (1978, p. 121),⁹ may be put in the form of a substantive proposition: unless provided with inducements to do otherwise, sellers will quote prices in terms of the medium of exchange; the MOA and MOE tend to coincide. The validity of this proposition is strongly supported by the evolutionary and historical analysis presented by White (1984). The proposition does not deny, of course, that there can be inducements--such as the presence of substantial inflation in terms of the MOE--for agents to make contracts in terms of something other than the MOE.

III. Fama

Let us now begin with a discussion of Fama (1980), which has been described as "perhaps the most influential statement of the new monetary economics."¹⁰ Fama's analysis in this paper centers on two hypothetical economies. The first of these is one in which there is no tangible medium of exchange. There is, however, a sophisticated accounting system of exchange (ASOE), access to which is provided by deposits held with banks.¹¹ Competitive interest rates are paid by banks on deposits and charges are made for transaction services provided to depositors. Deposits are heterogeneous in the sense that they are claims to portfolio shares, the composition of which may be tailored to the desires of individual depositors. Thus banks provide a second type of service--portfolio management. These services, like those pertaining to transactions, are priced competitively.

As this economy includes no MOE, it is a nonmonetary economy. Analysis of its workings in the absence of regulation then becomes a standard problem in real general equilibrium theory.¹² Fama uses this insight to assist in the analysis of the effects of government-imposed regulations, including controls on deposit interest rates and the requirement that banks hold (non-interest-bearing) reserves--fractions of their assets--with the government's "central bank." This approach makes it clear that a major effect of reserve requirements is simply to levy a tax on banks, thereby lowering deposit returns to depositors. As a consequence, households and firms "are induced to economize their holdings of deposits and so to incur replenishment and other costs that would be unnecessary in the absence of a reserve requirement" (Fama 1980, p. 47). The presumption would seem to be that this restriction is socially undesirable, a conclusion that seems reasonably convincing for this nonmonetary economy.¹³ Somewhat similar considerations pertain to deposit rate regulations.

Fama uses the foregoing framework to criticize arguments made by Johnson (1968), Pesek and Saving (1967), Gurley and Shaw (1960), and Patinkin (1961). The first two of these references contend that, in the absence of reserve requirements, deposit rate restrictions, and other regulations, the price level will "spiral upward" without bound while the second pair

claims that it will be indeterminate. The former suggestion, moreover, corresponds to Friedman's well-known objection to a system with "purely fiduciary currency issued by private parties" (1960, p. 7). Under such conditions, Friedman argues, "Any individual issuer has an incentive to issue additional amounts. A [private] fiduciary currency would thus probably tend through increased issue to degenerate into a commodity currency--into a literal paper standard--there being no stable equilibrium price level short of that at which the money value of currency is no greater than that of the paper it contains" (1960, p. 7). Now, the claims of these writers may be correct or incorrect--we will return to that issue below--but Fama's (first) model evidently cannot be used to decide one way or the other, for it pertains to a nonmonetary economy while those of the criticized authors all presume the existence of privately-issued paper money--either currency or deposits that are convertible into currency. Nor can Fama reasonably claim that his analysis indicates that no medium of exchange will exist in reality--i.e., that all transactions will take place via the ASOE or by crude barter--for there is simply no analytical basis for such a claim generated by his framework. Indeed, in a subsequent paper on the subject, Fama (1983) has developed rather convincing arguments to the effect that the services of currency and those provided by an ASOE will be imperfect substitutes and that actual economies should be expected to include non-interest-bearing currency as well as deposits that provide access to an ASOE.

There is one other way in which, in my opinion, Fama misuses this first analytical apparatus. That is in his discussion of how "banks get involved in the process by which a pure nominal commodity or unit of account is made to play the role of numeraire in a real world monetary system" (1980, pp. 49-50).¹⁴ My objection is most clearly seen in the case of Fama's spaceship parable (pp. 55-56), which begins with an unregulated nonmonetary economy of the type described above. In this economy the medium of account is steel, with "Ingots" of steel the unit of account. In this context, Fama suggests that for some arbitrary reason the government decides to replace the Ingot with an abstract unit of account called the "Unit." To generate a demand for the latter, the government requires all spaceship users to maintain a "reserve" of Units--i.e., bookkeeping entries--with the Central Unit Authority. As spaceship

travel is of real value, such a step will clearly create a demand for Units and will tend to induce agents to hold fewer spaceships, just as Fama says. And it may create a taxation opportunity for the government. But this does not imply that the Unit will become the economy's unit of account; creating a demand for Units is a necessary but not sufficient condition. Indeed, there is no evident reason why steel should not remain the medium (and Ingots the unit) of account. It would appear that the function of reserve requirements that is pointed out by the spaceship example is to create a demand for an intrinsically worthless entity issued and controlled by the government, not to dictate the unit of account.

Let us now turn to the second hypothetical economy, or class of economies, discussed by Fama. In this case competitive banks provide portfolio management and transaction services as before but now there also exists a tangible medium of exchange, namely, government-issued paper currency. The latter provides its holders with transaction services that are (by assumption) imperfectly substitutable for those offered by the ASOE. Furthermore, currency is supplied monopolistically by the government, but banks voluntarily hold stocks large enough to permit them to maintain convertibility between deposits and currency.

In this monetary economy it is reasonable to assume that currency will serve as the medium of account, in accordance with the proposition described in our Section II, and Fama makes this assumption. He also presumes that currency has a fixed own rate of interest of zero and that the government controls the size of the nominal stock of currency. Thus with a well-defined demand for currency in real terms (resulting from its services) and with a fixed nominal stock, its nominal value--and thus the price level--is well determined. Under these circumstances, there is no motivation for unregulated banks to take actions that would drive the price level upward.

Furthermore, we have seen above that the government can create a demand for intrinsically useless and non-interest-bearing "reserves" that it issues, either as pieces of paper or as bookkeeping entries. So it could impose reserve requirements on banks, in the present

economy, requiring them to hold reserves in some specified relation to bank deposits. If that step were taken, the government could then maintain determinacy of the price level without explicit concern for the quantity of currency in existence if it controlled the supply of reserves in nominal (unit of account) terms. Since deposits are valuable, and reserves are required for the existence of deposits, a real demand for reserves will exist and specification of the nominal quantity by the government will pin down the price of reserves.

In what units will these prices be quoted? According to the proposition of Section II above, currency would tend to remain the economy's medium of account and some currency unit would then be the unit of account. Reserves might be denominated in units that have a fixed value in terms of currency, but such would not be necessary. Provided that a market in reserves is not prohibited, the price level in terms of currency can be regulated via the supply of reserves even with the latter's value potentially variable in currency terms.

Does the analysis in this model of Fama's provide a valid basis for criticism of Friedman, Johnson, Gurley and Shaw, Pesek and Saving, or Patinkin? The answer would seem again to be "no" in the case of Friedman and Gurley/Shaw, for both are discussing monetary economies in which there is no outside currency (or reserves) for the government to control in nominal terms. And, as his readers will know, Fama explicitly agrees that his viewpoint is fundamentally consistent with Patinkin's.¹⁵ Johnson, however, is criticized by Fama for his statement that price level stability "requires social control over the total quantity of money supplied by the banking system" (Johnson, 1968, p. 43). In Fama's view, "the confusion in Johnson's interpretation of Patinkin probably arises from the fact that Patinkin ... treats ... deposits as money," i.e., does not distinguish between deposits and currency. In my opinion, Fama's insistence that currency and deposits be viewed as distinct entities is useful; to refer to "money" as the "product" offered by banks is more likely to lead to analytical error than to view banks as selling two (or more) types of services. But while Johnson's terminology is in this regard confusing, Johnson does manage to conclude--as would Fama--that "the central bank can control the price level if it fixes the yield on its liabilities and controls the quantity

thereof through open market operations, quite consistently with free competition in the banking industry" [including the absence of reserve requirements] (1968, p. 977).¹⁶

In sum, while Fama's criticism of others seems somewhat overdone, and one of his conclusions regarding the unit of account unwarranted, for the most part his analysis strikes me as useful. In particular, his emphasis on the nature of the various services provided by banks and on the difference between accounting and monetary systems of exchange would appear highly conducive to increased analytical clarity.¹⁷ In terms of substantive results, Fama's main theoretical conclusions seem--despite the unfamiliarity of his terminology and approach--basically consistent with standard neoclassical monetary theory as exemplified by the work of Patinkin, Johnson, and perhaps even some economists usually identified as monetarists (e.g., Meltzer, 1969).

Fama's paper may, of course, be interpreted not as a purely theoretical exercise--as it has been here--but as a practical proposal. Certainly his second piece on the subject (Fama, 1983) tends to create that impression. A few remarks pertinent to that perspective will be provided below in Section VII; for additional discussion see Helpman (1983).

IV. Black

The two analytical models used by Fama are in most respects similar to ones developed in a much earlier article by Fischer Black (1970). In this piece, Black describes a number of hypothetical economies, some of which are free of financial regulations and all of which incorporate an ASOE (together with or instead of a tangible MOE). Indeed, many of the distinctive insights and viewpoints of the BFH school can be clearly traced to Black's pioneering paper. The latter also features, however, a large number of assertions concerning the unimportance or vagueness of the quantity of money and the pointlessness of the quantity theory. These assertions are, in my opinion, unhelpful at best and serve to detract from the overall merit of Black's contribution. In the following paragraphs, a few examples of this type will be described.

Black's main discussion pertains to an economy in which all transactions are carried out by means of an ASOE or, almost equivalently, by checks written on bank deposits that are claims to portions of the bank's portfolio of assets. There exists, by assumption, no tangible medium of exchange in either case. There is, therefore, little analytical enlightenment provided by the observation that "there is nothing in this ... world that can meaningfully be called a quantity of money" (1970, p. 10). In other words, while this assertion is correct it does not imply that any form of vagueness applies to the concept of the quantity of money. On the contrary it is possible to say quite precisely what the magnitude of the money stock is, in this hypothetical economy: it is zero.

Elsewhere at Black's behest we "take one step in the direction of a more complex world by introducing currency. The federal government will print the currency, and will issue it to banks as requested" (p. 13) which will pass it on to individuals as requested, with appropriate credits and debits entered to accounts with the relevant banks. "Thus the amount of currency held by individuals and businesses will be determined by how much is needed for small payments. So long as the interest rate on bank accounts is positive, an individual will want to hold down the amount of currency that he carries, because currency earns no interest" (p. 13).

All of this sounds reasonably standard. But then Black indicates that there will be no need for any federal agency to fix the amount of currency outstanding" (p. 14) and concludes as follows:

Currency alone can hardly pass for the whole of money. The quantity of currency, in this world, will not be controlled by the central bank, and will not influence the economy. So even when currency is added to our model, the quantity of money can have no effect on output, employment, or prices, because the quantity of money does not exist" (1970, p. 14).

But this conclusion seems, to me, quite unjustified. There is a tangible MOE in this hypothetical economy, i.e., currency, and the stock of money is appropriately measured as the quantity of currency. It is unclear why Black believes this measure to be unsatisfactory. Is it because the government does not (by assumption) choose to control its quantity? Or because there are other paper assets in existence? Or because there are ways, not involving currency, of effecting transactions? But none of these potential reasons seems valid; none of them undermines the possibility of measuring the quantity of the medium of exchange--which in this case is simply currency.

A possible objection to my conclusion, that currency comprises the entire money stock in the current example, is that economists who employ the MOE definition typically include checkable deposits (as well as Federal Reserve notes) in their empirical measure of the U.S. money stock. But there is a compelling reason for that, namely, that U.S. institutions are such that checkable deposits are claims to currency, claims that can be executed without delay or significant financial penalty. That fact suggests that demand deposits should be treated as nearly perfect substitutes for currency from the standpoint of the nonbank public. It may be useful for some purposes, therefore, to view the sum of these two items as the existing quantity of the medium of exchange, even though payments by check actually involve transfers of claims to currency rather than transfers of currency itself.

There are, of course, serious problems that arise in any attempt to implement this concept empirically. A leading difficulty at the present point of time (i.e., 1984) would be to decide which actual accounts are, and which are not, checkable. But an analogous problem would

arise in any attempt to count the number of "refrigerators" in existence, or the number of "houses" or "computers." But it does not follow that neoclassical price theory is useless simply because it is impossible--as it is--to implement the notion of a commodity in an entirely unambiguous way.¹⁸

We turn now to Black's suggestion that, in any of his hypothetical economies, the quantity theory "has no place" or (in some cases) "becomes impossible even to formulate" (1970, p. 19). The simplest of these cases to handle is the one mentioned above in which some transactions are carried out by an ASOE and others by means of government-issued currency. Now the fact that currency does not provide the only means of effecting transactions is not sufficient to render inapplicable the quantity theory, by which I mean the proposition that an exogenously-imposed, one-time change in the quantity of money will lead to no lasting effect on real variables and ultimately to a proportionate change in the money price of goods.¹⁹ Indeed, this fact does not even suffice to invalidate the proposition (which is a different matter). To see that the quantity theory may be valid, as well as applicable, note that the model in question is one in which the entire money stock is of the outside variety. So if we presume that all real supply and demand functions are free of money illusion,²⁰ a standard Patinkin-style quantity theory result would prevail for a helicopter drop of currency. And if the economy is Ricardian, as I believe Black would assume, the result would also prevail if the money stock change were to come about via an open-market purchase of government bonds.²¹ One can of course obtain Black's conclusion by arbitrarily forbidding the government to take either of these types of action, which are the ones to which the quantity theory speaks. But to do that would be to argue vacuously that "result X cannot obtain because I assume the experiment cannot be performed."

But what about Black's featured economy, the one in which money truly does not exist, all transactions being effected via the ASOE (or by crude barter)? Here it is true that the quantity theory as usually expressed is inapplicable; the experiment of changing the money stock cannot be carried out while maintaining its quantity at zero. But for that point to be of

interest it would need to be the case that actual economies will soon exist which possess no medium of exchange. Furthermore, the main message of the quantity theory--namely, that exogenous changes in the quantity of specified paper assets will have no ultimate effect on the economy's level of real output--would appear to remain valid even in this setting.²²

V. Hall

The contribution by Hall (1982a) continues to promote banking deregulation but adds a new ingredient by turning in the direction of a commodity money standard. In this regard, Hall's proposal possesses an important similarity to the "commodity-reserve currency" scheme--itself a generalization of Alfred Marshall's (1887) "symmetallism"--that was exhaustively analyzed by Friedman (1951). The presence or absence of a tangible medium of exchange is not explicitly considered by Hall, but at least one passage (on p. 120) seems clearly to imply that the existence of such a medium is taken for granted. In any event, Hall proposes that the unit of account be defined as a commodity bundle including specified quantities of several goods, selected so that the exchange value of the bundle will tend to conform more closely to the general "cost of living" than would be the case with any single monetary commodity such as gold. The object is to prevent both trends and fluctuations in the price level--the cost of living in terms of the unit of account--which, it is presumed, are inimical to the welfare of the economy's individuals.

There are two important ways, however, in which this proposal of Hall's--even when interpreted as including a tangible MOE--differs significantly from the commodity reserve scheme discussed by Friedman. The first of these involves "gradual adjustments in the definition of the dollar [i.e., the unit of account] so that its purchasing power remains constant as time passes" (Hall, 1982a, p. 115). Without some type of adjustment there would be price level changes over time even with a composite-commodity bundle such as Hall's ANCAP,²³ so Hall proposes that the definition (the scale, not composition) of the standard bundle be adjusted in response to departures of the price level from a (constant) target value. This feature, which is based on an idea developed by Irving Fisher (1913), contrasts sharply with the usual commodity-standard principle whereby the definition of the standard bundle is fixed, supposedly for eternity.

Is this adjustable-bundle feature of Hall's proposal desirable? One possible objection that some might raise would characterize it as injecting "tinkering" or discretionary behavior into a

system that should be automatic in its workings. In fact, however, Hall's suggestion is that the adjustments would be made as dictated by a fixed rule (1982, p. 119). Thus the undesirable aspects of discretionary behavior, as explained by Kydland and Prescott (1977) or Barro and Gordon (1983), would not be introduced by Hall's scheme. The incorporation of adjustments of this type would of course tend to reduce the advantages of specifying the standard bundle as a composite commodity rather than a single good, such as gold.

The second unorthodox feature of Hall's version of a composite-commodity standard brings the discussion back to issues more distinctively characteristic of the BFH school proposals. The feature in this case pertains to provisions necessary to keep the prices of the commodities included in the standard bundle consistent with the definition of the unit of account as one standard bundle. The issue arises because, in order to minimize the possibility of government behavior that might be inflationary, Hall proposes that the government be forbidden to hold physical reserves of the relevant commodities or to intervene in commodity markets to influence the exchange value of the unit of account. (See Hall, 1982a, pp. 120-121.) Instead, the price of the standard bundle would be kept at par (i.e., at 1.0) by legal provisions that accurately describe the standard bundle, define its value as one dollar,²⁴ and proclaim this bundle to be the economy's sole legal tender (pp. 112, 118).

To investigate the workings of this system, we need to flesh it out in one or two respects. While, as mentioned above, Hall does not explicitly refer to a tangible medium of exchange, it is clear that he presumes that most payments would be made by transfer of paper assets or bookkeeping entries: "The option to take payment in commodities would never be exercised by anyone but an arbitrage specialist" (p. 120). For concreteness, then, let us assume that paper assets called "dollars" circulate as the MOE.²⁵ The question, then, is the following: what forces exist to maintain parity between the exchange value of paper dollars and that of the standard bundle? Hall's answer is that "whenever the sum of the prices departed from the set price by more than transaction costs, an opportunity for covered arbitrage would become available, and experience in countless markets teaches that experts quickly eliminate all

opportunities for covered arbitrage" (p. 118). But under what conditions is it true that arbitrage opportunities would exist? It is certainly clear that such opportunities would be available if the government was committed to maintain convertibility, by standing ready to exchange paper dollars and standard bundles one for one. But government intervention of this type has been ruled out. Another possibility is that banks²⁶ would maintain convertibility—but that duty would have to be undertaken voluntarily, since a governmental requirement to that effect would be inconsistent with the recommended absence of regulation. Hall's view, in any event, seems to be that convertibility commitments would be unnecessary; that the arbitrage opportunities would be created by the legal tender provision itself.²⁷ But that hypothesis seems to me unconvincing. What is meant by a legal tender provision is that the courts will not help a creditor to collect a debt if the creditor has refused payment offered by a debtor in an asset that has legal tender status.²⁸ The usual purpose of such a law is to confer acceptability on a secondary class of assets, by denying creditors help if they reject such assets and try to require payment in a preferred (and similarly-denominated) primary money. In particular, legal tender laws do not require that all contracts be specified in terms of legal-tender assets.²⁹ Thus, even if standard bundles are the sole legal tender asset in Hall's economy, it would be possible for buyers and sellers routinely to use paper dollars as the MOE and a paper dollar as the unit of account. Consequently, it would be possible for the paper dollar price of a standard bundle to differ from 1.0, without creating any arbitrage opportunity, if no one is committed to the maintenance of convertibility. Indeed, the paper dollar price of the standard bundle will vary directly with the number of paper dollars in existence; the function of convertibility is to force the quantity of the MOE to be such as to maintain the price standard.

The alternative idea here being pursued is that paper dollars might, under Hall's scheme, gain acceptance as the MOE by initially existing as claims to standard bundles—claims redeemable by banks that voluntarily maintain convertibility. But then, since it is costly to maintain the requisite commodity reserves and since the convertibility option is very rarely exercised, banks might eventually do away with this guarantee. The paper dollar would then

become an inconvertible paper asset, without legal tender status, that nevertheless functioned as the MOE—just as was the case with Bank of England notes between 1797 and 1821.³⁰ The paper dollar would have value, if this transpired, because of its MOE service flow, not because it was a claim to a standard bundle. Under such circumstances, it is clear that its value could depart from that of a standard bundle—just as the value of Bank of England notes departed from that of their nominal gold bullion equivalent in the early 1800's.

Hall's (1982a) argument against this suggestion is that "it is impossible" for the described situation to arise because "when sellers post a dollar price, they have the right to receive payment in resource units [i.e., standard bundles] instead of any other form of payment" (p. 118). But that argument presumes that buyers and sellers are making exchanges in which there is ambiguity as to whether the "dollar price" refers to paper dollars or standard bundles. Rational agents would not, however, engage in exchanges in which so much ambiguity prevailed. In atemporal transactions, both parties would (under the alternative scenario) take it for granted that posted prices refer to paper-dollar magnitudes.³¹ Loan contracts extending over time would be a different matter, because of the legal tender situation, and specific provisions would have to be made if these were to be specified in paper dollars. But such provisions could be routinely added at almost no cost. Bank accounts, finally, would be—under the present hypothesis—denominated in paper dollars rather than standard bundles.

The latter consideration indicates that Hall's outcome could probably be attained by a law—more sweeping than a legal tender law—declaring that no loan contracts would be enforced unless specified in terms of standard-bundle dollars. This would necessitate that bank accounts be denominated in these dollars, and that would probably result in the paper MOE consisting of claims to standard bundles. This sort of a law would, of course, constitute a serious limitation on the types of contracts that would be viable.³²

What the foregoing line of argument suggests is that if an economy has a paper medium of exchange, that paper will also tend to serve as the medium of account even if the

government intends that prices be quoted in terms of some other commodity (or bundle of commodities) and declares the latter to be legal tender. If convertibility of the paper MOE into legal-tender commodities is maintained, then the two potential units of account will coincide—but they need not in the absence of convertibility. This conclusion leads to two subsequent questions. The first is whether unregulated banks will be induced, by competitive pressures, to maintain convertibility voluntarily. The second is in what way the foregoing situation is changed if there is no tangible MOE. A partial answer to the latter will be attempted in the next section.

In a subsequent paper, Hall (1983) discusses an economy in which the government induces a demand for paper or accounting-entry "reserve certificates" by paying interest on them. These certificates are supposed to be different from ordinary government securities in that they serve as the MOA; one reserve certificate is the unit of account. Interest must be paid very frequently, however, to prevent sizeable downward jumps in relative value just after interest payments are made—an extremely awkward feature for the medium of account. Hall suggests, accordingly, that "the earnings of reserve certificates must accrue to their owners each day." He mentions two possible devices but indicates that "for the purposes of the rest of the paper, it does not matter exactly how the government sets up the reserve certificate. What will be important is the payment of a continuously accrued cash return to reserve certificates" (1983, p. 35).

Hall's objective in this paper is apparently to devise a system in which private agents will demand (and use as the MOA) an intrinsically worthless asset despite the absence of reserve requirements (and resulting inefficiencies as identified by Fama (1980)). But this objective is rather puzzling, for if the paper (or accounting-entry) asset is the MOE, agents will have a demand for it even if it does not pay interest. And if it is not the MOE, it is unlikely—as discussed above—to be adopted as the MOA.³³ The puzzle is deepened, furthermore, by Hall's insistence that "nothing in the nature of a fiduciary system requires that the reserve certificate functions as the medium of exchange" (1983, p. 34). For if his reserve certificates are not

going to serve as a MOE as well as the MOA, it becomes unclear why it is desirable to "saturate the economy" with them. The reason why Friedman (1969), Johnson (1968)(1969), and others recommend saturation with the MOE is precisely because it yields exchange-facilitating services.³⁴

The foregoing comments do not, it should be added, constitute a claim that it is impossible or undesirable to pay interest on a paper medium of exchange. There exists, nevertheless, an evident tendency for non-interest-bearing assets to be adopted by agents as the MOE. The discussion by Fama (1983, pp. 12-13) is helpful in understanding this tendency.

Another notable aspect of Hall's (1983) scheme is its use of a policy feedback rule to specify adjustments in an interest rate differential, thereby making the interest rate on reserve certificates--rather than any monetary aggregate--serve as the monetary authority's instrument. That an interest rate can be used as the monetary instrument without inducing price level indeterminacy in a neoclassical economy with rational expectations is explicitly demonstrated in McCallum (1981). The crucial requirement is that adjustments be made in a way that involves some nominal target, which is certainly the case in Hall's (1983) scheme. Hall's more recent writings on monetary reform³⁵ embody the interest-paying-reserves feature but concentrate on issues concerning macroeconomic targets that are outside the scope of this paper.

VI. Greenfield and Yeager

A scheme involving several of the distinctive features emphasized by Black, Fama, and Hall has been outlined by Greenfield and Yeager (1983) in a paper that also provides a useful exposition and delineation of several crucial issues. Basically, the Greenfield–Yeager scheme combines the notion of an unregulated accounting system of exchange (as promoted by Black and Fama) with that of a composite–commodity unit of account (as championed by Hall). The latter feature differs from that proposed by Hall, however, in that there would be no adjustments in the size of the standard commodity bundle and no legal tender provision. "Apart from defining the unit [of account] and enforcing contracts, the government would practice *laissez faire* toward the medium of exchange and the banking and finance system" (1983, p. 303). In particular, there would be no government–issued currency and no governmental commodity reserve fund. Furthermore, convertibility would not be provided by banks or other private agents.

One of the main objectives of the Greenfield–Yeager proposal is to separate the medium of account from the medium of exchange.³⁶ The motivation for this desire stems from the fact that money (i.e., the medium of exchange) is something for which agents have well–defined demands in real (price–level deflated) terms. But any potential supply–demand imbalance, brought about by a shift in either nominal money supply or real demand, cannot be relieved by the adjustment of a single price if money also serves as the medium of account. Instead, in this case, the general price level and thus the prices of millions of individual goods and services are required to adjust. But many of these prices move very sluggishly in actual economies, so transitional adjustments are forced to take place in other ways--most notably, by real income changes of the type emphasized in Keynesian macroeconomics. And these, it is taken for granted, are socially undesirable--hence the objective.

In developing their case, Greenfield and Yeager show themselves to be sensitive to the difficulty of separating the MOA and MOE when the latter exists in tangible form. Accordingly, they place considerable emphasis on the distinction between ordinary monetary

exchange and reliance on an accounting system. In fact, in places they seem to suggest that their proposed economy would be entirely non-monetary in nature.³⁷ Their desire for practical applicability leads them, however, to recognize the inevitable existence of at least a small amount of hand-to-hand currency to be used for some types of transactions.³⁸ This currency could in principle take the form of paper claims to shares of the portfolios held by funds or banks. "Alternatively, instead of being ownership shares, the circulating currency (and also some deposits) could be debt instruments issued by funds and other organizations denominated in the unit of account" (Greenfield and Yeager, 1983, p. 308). It would appear then, that there is in fact not a full divorce between the MOE and MOA provided by the Greenfield-Yeager scheme, but only a minimization of transactions carried out by way of the MOE. We will return to this point below.

As in the case of Hall's (1982a) scheme, a crucial issue involves "enforcement" of the definition of the unit of account--or, in terms that I would prefer, assurance of the conformity between the unit of account and posted prices of the constituent commodities in the standard bundle. The situation differs in three relevant respects, however, from that obtaining under Hall's proposal. First, Greenfield and Yeager abjure the legal tender provision relied upon by Hall. Second, Greenfield and Yeager wish to avoid reserve-based convertibility guarantees by any agent, even banks. Clearly, each of these first two differences has the effect of making unit conformity more difficult. The third difference, however, is the absence (or near-absence) of a tangible MOE, which works the other way.

To begin our consideration of the issue, let us first note that while the "definition" of the unit of account refers to a specified bundle of actual commodities, in practice Units would operationally consist of credit or debit balances in the records of the accounting system. Without convertibility, these Units are not claims to commodity bundles. They are simply claims to whatever one can manage to purchase with an accounting Unit. Or, if not spent, a Unit is a claim to a number of Units in the future, with the number depending on the rate of interest paid to account holders. Units serve, then, as a store of value.

Because of this store-of-value function, it was my impression from reading the Greenfield-Yeager paper that an inconsistency might arise between the definition of the Unit and the prices of the commodities in a standard bundle. For it is clear that, in the absence of convertibility and MOE services, Unit balances will have to pay holders an interest rate that is equivalent in real terms to what they could obtain from holding other assets, and the real return on (say) capital goods will presumably be greater (most of the time) than that provided by holding actual quantities of the commodities in the standard bundle. But it transpires that this fear was unfounded, that in fact there are just enough degrees of freedom for the Greenfield-Yeager scheme to avoid inconsistencies. To see this, suppose that q^1_t and q^2_t (with $q^1_t \geq q^2_t$) are the own rates of return on capital and standard bundles, respectively, and that the economy's taste and technology characteristics pin down those values and also the relative prices P^1_t/P^2_t and P^1_{t+1}/P^2_{t+1} , where P^j_t is the price of commodity j in period t in terms of accounting-system Units. Now for these Units to be held, it must be that

$$(1) \quad 1 + r_t = (1 + q^1_t) P^1_{t+1} / P^1_t$$

where r_t is the nominal rate of interest on Units, so that the real return from holding Units equals that on capital. The issue then is whether, with q^2_t and relative prices given, it is possible to have $P^2_t = P^2_{t+1} = 1.0$ as is required to avoid inconsistency. But clearly this is possible, for these given values simply pin down the right-hand side of (1), and thereby determine what r_t needs to be.

There would be trouble, of course, if we also required that the gross rate of return on physical storage of standard bundles be equal in nominal terms to the right-hand side of (1), with q^2_t given. But that is not a necessary condition; it is permissible that the rate of return on standard bundles be lower and these bundles not be held as assets.

This partially reassuring analysis can also, however, be used to demonstrate the free-floating feature of the scheme that gives rise to uneasiness. Just as r_t can be whatever is needed to satisfy (1) with $P^2_t = P^2_{t+1} = 1.0$, so can r_t be whatever is needed to satisfy (1) with

$P_t^2 = 1.5$ and $P_{t+1}^2 = 2.0$ --or any other pair of values. Unit of account prices are fully indeterminate. Thus each accounting Unit can be equal in value to one standard bundle--or it can be unequal. There is simply nothing in the market economy to make the relationship be of any particular type.³⁹

Greenfield and Yeager not only recognize this, but consider it to be an advantage. Indeed, it is a crucial element of their scheme--for, with the government providing no legal or coercive inducements toward adoption of the standard bundle as the unit of account, any "plausible rivals" (p. 313) could easily take over. This is the reason that their scheme requires the absence of any homogeneous medium of exchange: such a medium, in accordance with the proposition of Section II above, would tend to become the medium of account.

But, as mentioned previously, the practical side of Greenfield and Yeager recognizes that some hand-to-hand currency would continue to circulate in their economy. They attempt to escape the tendency for their MOE--fund liabilities in the form of coins and circulating paper (pp. 307-8)--to become the MOA by stressing the heterogeneity of funds (i.e., banks) and their portfolios. But if the circulating coins and paper are all denominated in Units, as they suppose (p. 308), then these physical entities would constitute an essentially homogeneous MOE. Consequently, it appears that there is reason to believe that the unit of account would in fact be captured by the MOE under their arrangements.

That capture would not necessarily present a problem unless it led to some market force tending to push apart the value of a Unit and the value of a standard bundle. But a serious possibility springs to mind almost immediately. While nothing is said explicitly to this effect, it appears that Greenfield and Yeager would expect (as suggested by Fama (1983)) that the paper MOE would be non-interest bearing.⁴⁰ But in this case the banks (or funds) would always have an incentive to issue more of these paper Units, in effect using them to purchase interest-bearing assets. Indeed, the incentive to issue additional currency would prevail as long as the (nominal) interest rate on paper assets exceeded zero and the exchange value of Units

exceeded the cost of printing paper Units. This, however, is a market force--and apparently a potent one--tending to undermine the scheme. One who believes that market forces are generally more effective than suggestions or expressions of sentiment by the government, would then believe that the exchange value of the Unit will be driven far below that of a standard bundle.

The argument of the preceding paragraph is clearly the same as that made by Friedman (1960, p. 7) (1951, p. 216) with respect to bank note issue in a system with unregulated banks and private fiduciary money. Friedman's conclusion has been challenged by Klein (1974), Hayek (1978), Vaubel (1978), and others by means of arguments involving differentiated currencies with flexible exchange rates. These arguments deserve attention, of course, but it would appear that such schemes are viable only when the banks provide convertibility⁴¹--into, in this instance, standard bundles--which more or less eliminates exchange rate variability. In any event, the Greenfield and Yeager scheme does not, as argued above, seem to feature such differentiation.

An implication of the foregoing discussion, briefly mentioned above, is that the Greenfield-Yeager plan does not, when realistically interpreted, accomplish the desired separation of medium of exchange and medium of account. For the actual medium of account is not the standard bundle of commodities, as the authors would wish, but currency and bookkeeping-entry Units of the accounting system. Only if these units were claims to commodities, i.e., only if Units were convertible into standard bundles, would these bundles be properly viewed as the medium of account.⁴²

Given the emphasis that I have placed on the absence of convertibility, it should be made clear that this is an aspect of their scheme that is viewed as important by Greenfield and Yeager. That viewpoint is clearly evidenced at various points in their discussion--see pp. 303, 306, and 314--but shows up most dramatically in their statement that "the commodities defining the unit ... would not have to be storable ... since the BFH scheme does not require

any direct convertibility..." (p. 305). This remarkable suggestion leads naturally to the following questions: if storability and convertibility are not required, why is it that commodities in the standard bundle have to be precisely gradable (p. 305)? Why cannot imprecisely gradable commodities and even heterogeneous services be included in the bundle? Indeed, what prevents the bundle from being precisely the same as one that pertains to the CPI or whatever price index the authors wish to stabilize? The answer to these questions can only be that the "definition" of the Unit would then be imprecise. But that, it would appear, is only of concern to economists contemplating the system. There is evidently no agent--no member of the economy--who would behave differently according to their story if the standard bundle were ill-defined. Or if there is, it is unclear to me who this agent would be.^{43, 44}

Finally, the Greenfield-Yeager (1983, p. 306) point of view that the unit of account is a pure convention, a matter of definition analogous to the definition of units of length,⁴⁵ calls for a brief comment. What needs particularly to be noted is that the proper analogue to the choice of a unit of length (e.g., the meter or yard) is the choice of the 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; if it were it would be of no consequence and the intelligent choice of a desirable unit could not have the marvelous effects on the performance of the economy that Greenfield and Yeager hope for! From this argument it follows that statements pertaining to "the definition of the unit of account" are syntactically incorrect and thus potentially misleading, the reason being that they lump together a definition (or convention) and a matter of substantive importance.

VII. Conclusions

The analysis of the foregoing sections has been seriously incomplete, in the specific sense that it has been concerned almost entirely with the feasibility--what Greenfield and Yeager (1983, p. 313) refer to as the operationality and determinacy--of the various BFH schemes. In particular, the discussion has shed no light on the stochastic operating properties, as expressed in the period-to-period variability of the price level or other aggregative measures, of the different systems and others with which they might be compared. Thus our investigation has pertained only to the viability, not the desirability, of the BFH schemes. But while that is certainly an unfortunate limitation, its imposition was (I believe) justifiable, for two reasons. The first and more positive of these is simply that an analysis of a system's viability, when it is at all in question, is a necessary first step toward the more complete undertaking. The second, and less positive, is that the present state of knowledge of the profession is not adequate for a truly useful dynamic analysis. The particular problem that I have in mind is the necessity, for the derivation of realistic stochastic operating characteristics, of an adequate model of price behavior. In this regard, I would consider unsatisfactory specifications positing complete price flexibility as well as ones that implicitly deny the validity of the natural rate hypothesis.⁴⁶

Subject to this limitation, let us try very briefly to summarize the main findings of the paper. One of these is that analytical clarity may be enhanced by focussing on the services provided by banking firms, rather than speaking of the production of money. Another, however, is that concepts of money need not be empty or nonsensical even in economies with advanced accounting-based transaction systems. A third point--or contention--is that medium of account status is not something that can be effortlessly bestowed on any commodity or group of commodities; that status will typically adhere to the medium of exchange.

At the substantive level, it seems clear that an economy with an unregulated banking sector and governmentally issued (and controlled) currency would be viable--i.e., would present no price level determinacy problem--and would reduce the inefficiency resulting from a sub-

optimal consumption of transaction services. Fama's (1980) (1983) proposal of this type is not, indeed, much different from arrangements promoted by monetarists. The second main class of systems considered by the BFH group--that with a composite-commodity medium of account and no convertibility provision--is quite different. If there were literally no medium of exchange present in the economy, the non-coercive governmental designation of the unit of account would encounter no inconsistency but would be extremely fragile since the actual medium of account would be bookkeeping entries that are not claims to the designated commodity bundle. In a more realistic version, with some circulating private currency, the latter would tend to become both MOE and MOA and would also tend to be overissued, thereby separating the unit of account from the officially-designated bundle. This fragility could be overcome by the imposition of legal tender and convertibility requirements, a step that would turn the system into one with a commodity-money standard.

A system of this latter type would be viable. It would presumably be one in which small amounts of commodity reserves would be held, so inefficiency from that source would be minimal. The main objections to such a system would then be those expressed by Friedman (1960, p. 6) in his classic statement of the reasons for government involvement in monetary affairs--namely, that banks would tend to overissue, occasionally fail, and in such cases impose important third-party effects on the system as a whole. It seems clear that extensive analysis of Friedman's hypothesis is of great importance; if it were found to be incorrect, a commodity-money system with unregulated banking might appear to be a viable alternative to the rule-based government control of fiat money currently preferred by monetarists.⁴⁷

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Footnotes

1. While the argument developed in Tobin (1963) has some aspects of similarity with the collection under review, the promotion of laissez faire policies and the emphasis on the unit of account were definitely not features of the New View writings. For unsympathetic reports on the latter, see Johnson (1970) and Meltzer (1969).
2. Yeager (1983, p. 308) by contrast, expresses sympathy with some monetarist ideas.
3. In particular, the implications of our substantive proposition of Section II are not given recognition.
4. There must, in addition, be very few distinct items serving as money.
5. This type of system was emphasized, and brought to the attention of monetary economists, by Black (1970) and Fama (1980). Note that the presence of "demand deposits" is not decisive: if there is no tangible medium (e.g., currency) for a demand deposit to be a claim upon, then it may be simply part of the accounting system.
6. Hall (1982a) emphasizes that a "dollar" used to mean 0.04838 ounces of gold.
7. Niehans (1978) uses "numeraire" in this way, as a synonym for medium of account.
8. See, for example, Hicks (1967, p. 3). It should be said that the three types of prices implicit in our discussion--i.e., prices in terms of numeraire, medium of exchange, and medium of account--do not correspond to Patinkin's (1965) three-way distinction between accounting, money, and relative prices. Thus an analyst may choose a numeraire so that the resultant prices are either money or relative prices, in

Patinkin's terminology. Furthermore, he does not recognize the possibility that the MOE and MOA can differ, so his money prices always correspond to the last two types in the present scheme. Finally, Patinkin's accounting prices are totally abstract conceptions, for which there is no counterpart in our discussion.

9. The point is not explicit in most discussions of the advantages of having a common unit of account, even those that are very clear about the latter. See, for example, Brunner and Meltzer (1971, p. 787).
10. See Hall (1982b, p. 1553).
11. It is reasonable to object to this terminology; since the "deposits" in question are equity rather than debt claims it would be more accurate to refer to them as "shares" and to the issuing firms as "funds." Nevertheless, as these distinctions are not crucial for the particular issues under discussion, I will here and in subsequent sections use language similar to that of the writers under review.
12. A qualification to this statement should be noted: the technology for providing transaction services may be subject to increasing returns to scale throughout the relevant range. In this case, the problem would not be one in standard competitive equilibrium theory.
13. Some reservation should be expressed because of the possibility of increasing returns, mentioned in fn. 12. Also, the economies provided by combining transaction services and portfolio management activities in the same firms also must be kept in mind.
14. In other words, the process by which an intangible and intrinsically worthless entity is made the medium of account.

15. See Fama (1980, pp. 53–55). It should be added that Gurley and Shaw (1960) also discuss systems in which the price level is determinate.
16. The case of Pesek and Saving is complicated by a crucial analytical error; the latter is explained by Johnson (1969) (1970).
17. One example of the importance of this distinction arises in attempts to model the costs of operating a bank. The activities involved in providing transaction services (record keeping and communication with clearinghouses) are quite different from those required to produce currency (printing and engraving). In my tentative opinion the analyses of Klein (1974) and Saving (1976) are marred by non-recognition of this distinction.
18. Allan Meltzer suggests another way to express the point, as follows. In the example there is an unambiguous definition of money as a theoretical term. The appropriate empirical counterpart is unclear, but the same type of difficulty applies to theoretical concepts like income, consumption, and so on.
19. While this concept of the quantity theory is not the one preferred by Friedman, it is in my opinion the one that corresponds most closely to the use of the term by the majority of monetary economists.
20. Free, that is, of unit-of-account illusion.
21. See, for example, Barro (1984, pp. 384–385).
22. Provided that we continue to presume that all real supply and demand functions are free of money illusion.

23. This bundle is one "comprising 33 cents worth of ammonium nitrate, 12 cents worth of copper, 36 cents worth of aluminum, and 19 cents worth of plywood (all in 1967 prices)." See Hall (1982a, p. 115).
24. For the remainder of this example, we will follow Hall's lead and use "dollar" to refer to the unit of account. Also, the adjustments referred to in the preceding paragraphs are now abstracted from, for simplicity.
25. Consideration of a related system with no MOE appears in Section VI.
26. Or other private businesses.
27. Since this was written, Hall has reported to me that he presumes that the legal system would interpret paper dollars as claims to standard bundles, thereby requiring the banks that issue paper dollars to maintain convertibility.
28. See Vaubel (1978) or Hayek (1978).
29. The point was put by Adam Smith (1776) as follows: "A positive law may render a shilling legal tender for a guinea ... but no positive law can oblige a person who sells goods and who is at liberty to sell or not to sell, as he pleases, to accept a shilling as equivalent to a guinea in the price of them."
30. Descriptions of the experiences are provided by Viner (1937) and Horsefield (1944).
31. And competitive forces would do away with sellers who tried to demand payment in resource bundles after reaching agreement.

32. During the discussion period at the conference, Stanley Fischer described Hall's scheme as one involving "compulsary indexation."
33. This possibility is mentioned by Stockman (1983), in a useful comment on Hall (1983) that also recognizes the point regarding "saturation" brought up in the next sentence.
34. One possible response might be that it is desirable to saturate the economy with reserve certificates because they are useful to banks in the account-clearing process. But Hall (1983, p. 37) also rules out that: "None of the aspects of the monetary system discussed in this paper depend on whether or not reserve certificates participate directly in the mediation of transactions."
35. See, for example, Hall (1984).
36. This objective shows up even more clearly in Yeager (1983).
37. See, e.g., Greenfield and Yeager (1983, pp. 303, 305).
38. See Greenfield and Yeager (1983, p. 307).
39. This indeterminacy corresponds closely, I believe, to that described by Niehans (1982) in a rather similar economy (i.e, one without a MOE).
40. "If ... BFH funds kept their shares worth 1 unit of account each, then some bearer shares could circulate as coins and notes. Only a small fraction of all shares would presumably take that form, however, unless some convenient way were devised for adjusting ... the number of shares circulating as currency to vreflect the earnings or losses of individual funds" (Greenfield and Yeager, 1983, p. 308).

41. This viewpoint is taken by Fischer (1983, p. 13) on grounds of dynamic inconsistency.
42. This statement is applicable whether or not there is a tangible MOE.
43. There is a natural place in which convertibility (and the requirement of a well-defined standard bundle) might be introduced into the system, namely, at the clearinghouse juncture connecting different bank-fund firms. If certain settlements were required to be paid in standard bundles, rather than financial portfolio assets (which is what I understand the authors to propose on p. 307), then Units could be linked more firmly to standard bundles.
44. In a letter to me, Yeager has explained that the proposal envisions indirect convertibility: "competition would probably lead institutions to cash checks (if their holders so desired) and redeem currencies and deposits in whatever quantities of a convenient redemption medium (such as gold or actively traded securities) equalled in total value as many standard commodity bundles as the numbers of units of account denominating the obligations to be redeemed." In such a case, there would indeed be no problem of conformity of the values of Units and standard bundles. But in such a case the Greenfield and Yeager claim that their system "is not a variant of the often-proposed composite-commodity or commodity-reserve money" (1982, p. 303) system would seem highly misleading, as would the claim that "the BFH unit of account does not require 'implementation' through convertibility of any familiar sort, anymore than does maintenance of the defined length of the meter." Furthermore, the UOA would not be divorced from the MOE significantly more than it is in a commodity money system in which paper claims circulate as the actual MOE. With "indirect convertibility," the Greenfield-Yeager scheme amounts to a private commodity-money standard with fiduciary elements.

45. Also see Yeager (1983, p. 324) and Hall (1982a).

46. The absence of adequate models of price behavior also implies an absence of any satisfactory indicator of social welfare, even in models with explicit specifications of tastes and technology.

47. Recent attempts to begin such an analysis have been provided by King (1983), Vaubel (1982), and White (1983).