BENJAMIN KLEIN*

The Competitive Supply of Money

FEW AREAS OF ECONOMIC ACTIVITY can claim as long and unanimous a record of agreement on the appropriateness of governmental intervention as the supply of money.[1] Very early in our history money was recognized by policy makers to be "special," and individuals fearful of government influence in other areas of economic life readily acknowledged that government had a primary role in controlling monetary arrangements. Free market advocates who now argue for, among other things, unregulated entry and the elimination of all interest rate and portfolio restrictions do not opt for a completely unregulated money industry, but recognize that money has unique characteristics which require that it not be supplied freely as an ordinary good. The monetary role of government is agreed to include, at a minimum, the monopolistic supply of a currency, into which all privately supplied demand deposits should be convertible. In

*This paper was presented at the American Bankers Association Conference of University Professors held at Lake Arrowhead California, September 1970. Publication of the article and comments to it are made possible by the support of the Center for Research in Government Policy and Business, University of Rochester.

The essential argument of this paper was originally presented at a University of Chicago Money workshop in June, 1968. I am especially indebted to Armen Alchian and also to Stephen Friedberg, Milton Friedman, Levis Kochin, Roger Kormendi, Edward Lazear, Mather Lindsay, Joseph Ostroy, Sam Peltzman, Douglas Shetler, and Earl Thompson for useful comments and discussions on the succeeding drafts of the paper. I would also like to gratefully acknowledge research support from the Lilly Endowment, Inc. grant to UCLA for the study of property rights and from the UCLA Research Program in Business Economics and Policy. I alone should be held responsible for the views expressed and for the remaining errors.

[1] A major exception was Herbert Spencer, who advocated a completely laissez-faire policy towards money [35, pp. 354-360]. Rothbard [33] has more recently advocated, on fundamentally ethical grounds, the adoption of an unregulated gold money supply.

BENJAMIN KLEIN *is associate professor of economics at the University of California, Los Angeles.*

addition, reserve requirements are often considered appropriate. This paper is an attempt to begin to identify the peculiar characteristics of money that necessitate this expanded governmental responsibility in the money industry.

Section 1 starts from the "money is a good" theoretical framework, i.e., assumes that a demand for money exists. We initially assume that all money supply changes are fully anticipated and therefore the nominal quantity of each competitive firm's money (and the price level in terms of each particular money) is in metastable equilibrium. Within this context Friedman's argument that unregulated competitive production of money will lead to an infinite price level is examined. The argument is shown to use an improper concept of competition by implicitly assuming that competitive firms are producing indistinguishable monies. If product quality is a function of total supply, then consumers must be able to distinguish between the products of different firms if a competitive market is to function. In Section 2 we introduce information costs regarding money supply changes and therefore the possibility that firms may "deceive" their customers by supplying more money than anticipated. But it is shown that if consumers and producers make the same estimate of the short-run profits from a policy of deception, then the equilibrium quantity of brand-name capital will insure that firms will not excessively overissue. In the process the distinction between "commodity" and "fiduciary" money is blurred. In Section 3 we examine actual monetary arrangements to determine the applicability of the analysis, and implications for international monetary relations are drawn. Finally, in Section 4 an attempt to rationalize the government's role in the money industry is made.

I. The Competitive Supply of Monetary Services

A. The Price of Monetary Services

If money is considered to be a durable good yielding a service flow, the stock of money must be distinguished from the flow of "monetary services." Whatever the service flow from *holding* money consists of, its services depend on the eventual or possible *spending* of money and therefore on the exchange rate of money for real commodities. Hence, the real monetary-service stream N yielded to an individual holding M_j nominal units of the jth money-producing firm's money is negatively related to the price level P_j of goods and services in terms of the jth money and is assumed homogeneous of degree zero in money prices; viz,

$$N = N((M/P)_j, \beta_j), \tag{1}$$

where β_j represents the "confidence" (to be defined later) the individual has in the future exchange value of the jth money and each individual is assumed to hold only one firm's money.

Assume that the jth money also yields an explicit pecuniary rate of return (or interest payments) of $(r_M)_j$. Assume further that there are financial assets, called "bonds," which are claims to a future nominal unit of the jth money and which yield no nonpecuniary monetary-service returns but do yield pecuniary interest payments in terms of the jth money at the rate of i_j. The pecuniary alternative cost per unit time, in terms of the jth money, of holding a unit of the jth money is therefore $(i - r_M)_j$. In equilibrium, $(i - r_M)_j$ must equal the value of the monetary-service stream from a marginal unit of the jth money and will be the rental price of holding a unit of the jth money. The real rental price of a unit of monetary services produced by jth money holdings is therefore, in equilibrium, given by:

$$(P_N)_j / P_j = (i - r_M)_j / [(\partial N / \partial M_j) \cdot P_j], \tag{2}$$

where $(\partial N / \partial M_j)$ is the marginal product in monetary services of the jth money and (if the individual is assumed to be a price taker with respect to changes in his own money holdings) is equal to $(\partial N / \partial (M/P)_j)\,(1/P_j)$.

B. Competitive Equilibrium

Assume that there is a perfectly competitive unregulated monetary service industry operating under conditions where consumers costlessly possess perfect information regarding future money supply and price level changes. Let C_j represent the jth firm's real costs of producing monetary services, where

$$C_j = C_j(N). \tag{3}$$

Each firm producing money faces an infinitely elastic demand curve with respect to the real price of its monetary services, and therefore, in equilibrium, the real rental price of monetary services will equal the firm's real marginal cost of producing monetary services, dC_j / dN:

$$\begin{aligned}(P_N)_j / P_j = dC_j / dN \equiv [\partial C_j / \partial (M/P)_j][d(M/P)_j / dN] \\ + [\partial C_j / \partial \beta_j][d\beta_j / dN].\end{aligned} \tag{4}$$

Under conditions of fully anticipated money supply changes, consumer confidence β_j can be assumed to be unlimited and therefore the competitive equilibrium (4) becomes

$$(i - r_M)_j = dC_j / d(M/P)_j; \tag{5}$$

i.e., the alternative cost of holding a unit of the jth firm's money is equal to the jth firm's real marginal cost of producing real cash balances.[2]

Assuming each firm has identical costs of producing monetary services, equilibrium condition (5) yields the competitive equilibrium quantity of monetary services and real cash balances produced by an individual firm and the competitive interest payment on money. And given the market demand for monetary services, the equilibrium determines the total rate of monetary services supplied and the number of firms in the money industry. If the real costs of producing real cash balances are assumed to be zero, then competitive interest payments on money will equal "the" interest rate and the number of firms in the industry is indeterminate. Demanders can be assumed to differentiate between firms, and therefore the market is shared among firms, on the basis of nonprice factors.

C. Finite Price Levels

It is commonly asserted that "fiduciary" (zero marginal production cost) money cannot be supplied under conditions of unregulated laissez-faire competition without leading to an infinite price level. However, the competitive equilibrium described above does not imply an infinite price level. First, since each firm produces a different, distinguishable money, the concept "price level" is ambiguous; with many monies circulating side by side at flexible market exchange rates, we can only unambiguously talk about the price level in terms of a particular money.

If we assume that all money supply changes are anticipated, then the quantity of each particular money and the price level in terms of that money may be indeterminately large or small, but this metastable equilibrium with respect to each firm's nominal quantity of money is of no importance. The initial nominal quantity of each firm's money is assumed to be arbitrarily determined and is analogous to the question of what to call the particular monetary unit.[3] And perfectly foreseen changes in the supply of a firm's money will not change its profit or the cost to the consumer.

If a money-producing firm increases its outstanding nominal money by purchase of real goods and services or of bonds denominated in another firm's money, then it may (erroneously) appear that the real value of

[2]This statement is somewhat difficult to interpret since a firm only indirectly "produces" $(M/P)_j$ by altering $(i - r_M)_j$ and β_j, i.e., by altering the amount demanded. Real output is conceptually not a control variable of the firm but ultimately determined on the demand side—a unique characteristic of the money industry.

[3]In a more realistic information-scarce world, the denomination of a monetary unit may have important effects on consumer confidence. Consider, in this context, the many currency reforms which countries undertake and the number of currencies that are called "dollar" or "pound."

the firm's net wealth will increase with its supply of money. A money supply increase will reduce the real value of the money stock obtained by customers in previous exchanges without changing the real value of what the previous customers exchanged for the money. Wealth maximization would seem to imply an unlimited once-and-for-all increase in the firm's money and an infinite price level. But such a conclusion follows only if all money supply increases are unanticipated. The money firm would then be "deceiving" its previous money holders by depreciating the value of their holdings when no future money increase and depreciation were anticipated and contracted for at the time of the earlier exchanges. We have, however, here assumed that such unanticipated changes in the supply of a money were impossible. Therefore, the present price of the monetary services from a particular money reflects all future changes in the supply of the particular money. The wealth-maximizing actual (and anticipated) level of the nominal stock of money will therefore not be unique.[4]

The competitive *rate of change* of each individual firm's nominal money supply and price level is also not unique. Our perfectly competitive anticipated money supply world implies that the actual rate of change of the jth firm's money $(\dot{M}/M)_j$ equals the anticipated rate of change of the jth firm's money $(\dot{M}/M)_j^*$ and also equals the actual $(\dot{P}/P)_j$ and anticipated $(\dot{P}/P)_j^*$ rate of change of prices in terms of the jth firm's money. The higher the anticipated rate of change of any firm's money (and therefore the higher the anticipated rate of change of prices in terms of its money), the higher "the" nominal rate of interest in terms of the firm's money and therefore the higher the anticipated and actual cost to consumers of holding the firm's money. If the firm is to make any sales, it must now pay a higher rate of interest on its money to keep the alternative cost of holding its money $(i - r_M)_j$ constant.[5] Consumers are indifferent between monies of varying anticipated rates of price change and interest yields as long as the implied rental price of monetary services from a unit of money is identical. And money producers are also indifferent between different combinations of $(\dot{M}/M)_j$ and $(r_M)_j$ as long as they all imply identical $(i - r_M)_j$ values. Given costless information regarding future money supply changes, distinguishable monies, and interest payments on money,

[4]The usual competitive model is often said to implicitly assume that all contracts are enforced costlessly. It may be more enlightening to say that the usual model implicitly assumes perfect information and therefore parties to a contract know when a contract will be broken; *unanticipated* broken contracts are not possible. The implicit economic (as opposed to common usage) concept of "contract" refers to anticipated outcomes, not to verbal or written agreements; and therefore, with perfect information, "contracts" cannot be broken.

[5]Real interest payments on money must equal "the" real rate of interest minus the real marginal costs of producing real cash balances. And since all money changes are anticipated and equal to price changes, $(r_M)_j = \rho - [dC_j/d(M/P)_j] + (\dot{M}/M)_j$; where ρ is "the" real rate of interest. A money producing firm therefore cannot make interest payments on its money simply by increasing its money supply. Interest payments on money must be greater than the rate of increase of the firm's money supply by $\rho - [dC_j/d(M/P)_j]$.

there is no unique profit-maximizing rate of increase in the supply of a competitive firm's money. A condition of metastable equilibrium exists with regard to nominal magnitudes.

D. Previous Arguments

Economists have earlier argued that unregulated competition in the supply of fiduciary money would lead to an infinite price level. For example, Boris Pesek [29, p. 889] has recently argued that if the marginal cost of producing money were zero, competition in the money industry would be "self-defeating" because it would result in a situation where "money is 'so abundant' as to sell for a zero price and be a free good. . . . This guarantees further retrogression into full-time barter since free money is worthless money, incapable of performing its task of facilitating exchanges of goods among persons." (Also see Pesek and Saving [31, pp. 86–87].)

Pesek confuses the rental price of the monetary services derived from holding money with the exchange value of the money asset.[6] A zero rental price of monetary services from a money is not necessarily associated with an infinite price level in terms of the money, i.e., a worthless money asset. A zero price of monetary services from a money implies, instead, that individuals will hold a quantity of *real* money at which the marginal value of monetary services is zero. If there are zero marginal costs of producing *real* money balances (which is what Pesek must be referring to in the context of the optimal monetary growth models in which he makes his comment), the competitive equilibrium supply of monetary services implies a supply of *real* cash balances which are "so abundant" as to make the monetary services from them a free good, but would not imply a value for the supply of *nominal* money. The competitive equilibrium nominal quantity of a money and hence the price level in terms of the money must be determined elsewhere.[7]

[6]This distinction between the opportunity cost of monetary services to holders of money and the purchasing power of money has been emphasized by Johnson [16].

[7]The optimum quantity of money literature generally ignores the distinction between the marginal cost of producing additional nominal money and the marginal cost of producing real cash balances. The fact that it is costless to "add a zero" implies nothing about the marginal cost of producing real cash balances (or monetary services). Note that Pesek and Saving [30] make the additional analytical error of asserting that if $(r_M)_j = i_j$, then the quantity of money would vanish. They are confusing two distinct theoretical concepts: the capitalized value of the monetary service stream from money and the nominal quantity of money. The marginal value of the monetary service stream from money, and hence the former concept, could equal zero without the quantity of money vanishing. Their error is analogous to the more general mistake of measuring the quantity of capital in terms of its market value. The quantity of money should be defined in nominal units (e.g., the number of dollars) and distinguished from the capitalized value of the monetary services from the units. $(r_M)_j = i_j$ implies that the capitalized marginal value of the monetary service stream from a unit of the money is zero but it does not imply that the money is "worthless." The capitalized value of all the returns on the margin from a unit of a money, the interest payments and the monetary services $[(r_M)_j + (\partial N/\partial M_j)\ (P_N)_j]$, must, of course, always equal one unit of the money. If all costs and returns are measured properly, then money, like every other asset held and exchanged in the economy, must yield "the" interest rate.

In our model, equilibrium nominal stocks of monies (and their rates of change) are arbitrarily determined, irrelevant magnitudes. Others have asserted, however, that if there are zero marginal costs of producing *nominal* money balances, then competition in the money industry would yield an infinite quantity of money and therefore an infinite price level. Friedman [9, p. 7] makes an especially lucid statement of this latter argument:

> So long as the fiduciary currency has a value greater than its cost of production—which under conditions can be compressed close to the cost of the paper on which it is printed—any individual issuer has an incentive to issue additional amounts. A 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. And in view of the negligible cost of adding zeros, it is not clear that there is any finite price level for which this is the case.

Friedman's conclusion, while similar to Pesek's in claiming that competition forces the exchange value (what Friedman calls "the market value") of money to zero or the price level to infinity, does not confuse the price of monetary services from a unit of nominal money with its exchange value. His argument is correctly based on the competitive determinants of the nominal, not real, supply of money and hence of the price level. The argument is based, however, on the implicit assumption that a necessary condition for the existence of "competition" is the sale by all firms in an industry of *indistinguishable* homogeneous products. Acceptance of this condition for the money industry would lead to an infinite price level equilibrium. But if individual producers of money differentiate their products (e.g., by placing their names on the money they issue), profit maximization will not induce each producer to expand his money production without limit.

It is true that if, for example, a new money producer could issue money that was indistinguishable from an established money, competition would lead to an overissue of the particular money and the destruction of its value. The new firm's increase in the supply of money would cause prices in terms of that money to rise and, if anticipated, leave real profit derived from the total production of the money unchanged. But there has been a distribution effect—a fall in the established firm's real wealth and a rise in the new firm's real wealth. The larger the new firm's money issue the greater its profit; therefore profit maximization implies that the new firm will make unlimited increases in the supply of the money, reducing the established firm's profit share close to zero (unless it too expands).

If the established firm legally possesses a trademark on its money, this "externality" of the new firm's production represents a violation of the established firm's property right and is called counterfeiting. Lack of enforcement of an individual's firm's property right to his particular name will permit unlimited competitive counterfeiting and lead to an infinite

price level. This merely points up the difficulties in the usual specification of competitive conditions. If buyers are unable to distinguish between the products of competing firms in an industry, competition will lead each firm to reduce the quality of the product it sells since the costs of such an action will be borne mainly by the other firms in the industry. Competition will therefore, via a form of Gresham's Law, drive firms that do not reduce the quality of their products out of business and lead to the complete depreciation of the quality of product that is marketed in the industry.

But indistinguishability of the output of competing firms will lead to product quality depreciation in *any* industry.[8] In the money industry these problems are merely exaggerated. Consumers may distinguish between outputs in an industry (and thereby form an expectation about the quality of a product that may differ from the industry-expected product quality) by either directly examining the technical characteristics of the product or by noting the name on the product. Consumers generally rely on both of these methods when attempting to determine the quality of products they are purchasing. The greater the costs of judging quality by directly examining the technical characteristics of the product, the more consumers will rely on brand names.

For fiduciary money consumers must rely solely on the brand-name method of obtaining information about quality since the monetary service flow from a money is assumed to be independent of any technical characteristic of the money (e.g., the size or color of a currency).[9] If property rights to a firm's name are not enforced consumers will not be able to distinguish between the output of different firms, and the quality of money sold will be destroyed.[10] Hence brand-name differentiated output is necessary for the competitive production and sale of money.

Friedman implicitly assumes that firms in a perfectly competitive industry produce output that is not differentiated by brand names. This condition,

[8]Goldman [11] observes that Soviet Union economic planners have recognized the necessity of requiring producers to imprint their individual "production marks" on their output to maintain quality.

[9]If consumers could costlessly examine and thereby costlessly obtain information regarding the quality of products, the lack of brand names would have no effects. But for money (and insurance policies, bonds, theater tickets, and anything else purchased solely on the "promise" of future performance) inspection is irrelevant.

[10]This is not entirely correct. A producer may rely on some unique physical characteristic of his money that, although it produces no monetary services, differentiates his output from that of other firms. The characteristic becomes his trade name. But if property rights are not enforced on this physical characteristic other firms will imitate it. This phenomenon can now be observed in the illegal drug industry where lack of producer trade name enforcement results in attempts to physically differentiate products and competitive "counterfeiting." Buyers rely almost completely on the reputation of (distinguishable) retailers. The major difference between money and other goods may be that the lack of examinable technical monetary service producing characteristics, combined with the high costs for firms to determine and rely on the reputations of their many money-using customers, makes the costs of producing indistinguishable substitutes (relative to the market exchange value of the product) much lower for money than for other goods and therefore increases the incentive for counterfeit production.

when applied to a product with high costs of determining quality by direct inspection of technical characteristics, will result in a higher price per unit service flow; when applied to money, a product with essentially infinite costs of determining quality by direct inspection of technical characteristics, it implies an infinite equilibrium price level. A more meaningful way to stipulate "perfect" competition is to assume costless consumer identifiability of sellers and to refer solely to the elasticity of demand facing individual sellers. We will therefore assume that each firm (*a*) possesses a distinct "brand name" (formally represented by the subscript *j*) and (*b*) is a price taker. No costs need be borne by anyone to enable buyers to identify the producer of a product, nor for the government to police and enforce property rights and prevent forgery. The many different monies may be completely homogeneous with regard to physical characteristics and are distinguishable only in the sense of having unique uncopyable names, none of which (given our assumption concerning costless knowledge of future money supply changes and therefore the absence of any "confidence" problems) have any value. The names merely permit consumers to costlessly distinguish between the output of competing firms. Although consumers have desired ratios for different real money holdings to one another (determined by nonprice factors), the monies are assumed to be perfect substitutes for one another on the margin and each firm faces an infinitely elastic demand for monetary services curve.[11]

E. Fixed Versus Flexible Exchange Rates

Friedman's contention that competitive equilibrium in the money industry implies an infinite price level is therefore seen to be based on the implicit and misleading assumption that all monies are indistinguishable. A more general statement of this critical assumption is that the different monies are convertible into one another by all producers and consumers at unchanging *fixed* exchange rates. Our competitive model assumes, on the contrary, that different monies exchange with one another in the market at freely determined *flexible* exchange rates. Gresham's Law, in the form stated above, is therefore not applicable.

If every money-producing firm guaranteed to convert its money into every other firm's money at a given fixed exchange rate, then competition would lead each firm to attempt to inflate at a higher rate than all other firms. Each firm would want to run a "deficit" in its trade clearing accounts with all other firms, financed by the increased holdings by the other firms

[11] My colleague Earl Thompson [38] has independently characterized a competitive money production equilibrium in a similar way. He, however, relies on a unique physical characteristic of each firm's money (e.g., a particular color) as the necessary identification mark analogous to my "brand name." In this context both are merely devices relied upon by consumers to distinguish between the output of competing firms.

of its costlessly produced money. Indistinguishability of different monies merely strengthens the argument by eliminating the *possibility* of ever changing the fixed exchange rate peg between the different monies. If, however, the multiple monies circulated at market-determined flexible exchange rates, changes in the supply of any one money relative to another money would alter the exchange rate between the monies. Anticipated money supply changes and distinguishability of individual monies is sufficient to guarantee that deficits between firms would not arise. The incentive for each firm to inflate at a higher rate than competing firms is eliminated.

II. Consumer Confidence

In this section we continue to assume that distinguishable competitive monies circulate at flexible exchange rates with one another and that the costs of distinguishing the monies and enforcing property rights are zero (and therefore counterfeiting is impossible). But we introduce information costs regarding future money supply changes and therefore the possibility that money-supplying firms may "deceive" their consumers by overissuing (i.e., by increasing money more than anticipated). Given this uncertainty, consumer confidence regarding the future exchange value of a money now becomes a factor in the production of monetary services.

A. Brand Names and Consumer Confidence

If information about future performance is costly, information is a valuable product. The brand name of a firm is then not only an identification mark but also a capital asset. The market value of the firm's "reputation" reflects the confidence consumers have that the actual quality of the product, when consumed, will equal the quality that is anticipated, and therefore paid for, when the product is purchased. Reliance on brand names is a means that consumers use to decrease the costs of judging credibility of fulfillment of contract.

Define the anticipated quality of a nominal unit of a money over a particular time period as a negative function of the mean of the anticipated rate of price change distribution of the money over the period. Assume that this is the quality of money consumers pay for when they purchase monetary services; i.e., it is the mean anticipated rate of price change that is embodied in the market rate of interest in terms of the money i_j.

In a costly information world individuals realize that the actual rate of change of prices may not equal the mean anticipated rate of price change; i.e., the anticipated rate of price change probability distribution has a variance. Assume that the real market value of the jth firm's

brand-name capital, represented by β_j, is negatively related to the variance of the anticipated rate of change of prices in terms of the jth firm's money. The value of the brand name of, or consumer confidence in, a money is therefore assumed to be related to the anticipated *predictability* of the future price level in terms of the money, while the quality of a nominal unit of money is assumed to be related to the anticipated *stability* of the future price level in terms of the money.

We previously concluded that if competitive interest payments were made on monies, then consumers would be indifferent between monies of differing quality, as long as the alternative costs of holding the different monies $(i - r_M)_j$ were identical. However, given the possibility of unanticipated money supply changes, an increase in the predictability of a money's future exchange price will increase the monetary service flow from a given real quantity of the money and lower the money's implied price of monetary services. The demand in real terms for a particular firm's money is therefore not only a negative function of the alternative cost of holding the money but is now assumed to be also a positive function of the consumer confidence in the money. Therefore at a given alternative cost of holding different monies, high confidence monies will drive out low confidence monies.[12]

The existence of information costs and hence valuable firm brand names does *not* imply that the model must now be considered under the rubric of "monopolistic competition." We must distinguish between imperfect information and a less than perfectly elastic demand curve. Although some firms may be supplying higher confidence monies at higher alternative costs than other firms, our representative individual analysis assumes that there is a unique scalar measure of the monetary service flow. Therefore we are not prohibited from assuming that every firm faces an infinitely elastic demand for its monetary services and that all charge identical real rental prices for monetary services.[13]

[12] "Jevons (in *Money and Mechanism of Exchange*, pp. 64, 82) has called attention to the theory of Herbert Spencer that if private coinage were established, the honest coiner would gain possession of the circulation and drive out inferior coins" (quoted in Laughlin [21, p. 52].)

An increase in the confidence of a money has two different effects on the demand for the money: (1) a decrease in the demand for money because $(M/P)_j$ and β_j are substitutes in the production of monetary services (an increase in β_j implies that less $(M/P)_j$ is demanded to produce a given monetary service flow), and (2) an increase in the demand for money because real cash balances and monetary services are complements in consumption (an increase in β_j may decrease $(P_N)_j$ and hence increase the desired monetary service flow). Since firms are assumed to be facing an infinitely elastic demand for monetary services, the second effect is assumed to predominate. See Klein [18] for a more complete discussion.

[13] It is noteworthy that Chamberlin [6, Appendix E] advocated a policy of permitting imitation and infringement of "trade marks." Protection of property rights on a trade mark could be justified, he asserted, if trade marks merely "identified" products; but they also "differentiate" products. Therefore, for the consumer "the name stands for a certain quality, a certain product not a certain producer, and to permit only one producer to use the name is to grant him a monopoly of this product" (p. 272). Our analysis more nearly conforms to the ideas of Knight who, nearly fifty years ago, stated that "the buyer being the judge of his own wants, if the name makes a difference to him, it constitutes a peculiarity in

B. The Equilibrium Quantity of Brand-Name Capital

Reliable information about anticipated performance is costly to produce and therefore consumer confidence is not a free good. Commodity money produces consumer confidence by placing a *physical* constraint on money production and hence on the possible unanticipated depreciation. "Guaranteed" convertibility of a money into a commodity (or into another more predictable money) is another way to obtain consumer confidence, and any stocks of the commodity (or the high confidence money) held as reserves to increase that assurance should also be considered an investment by the firm in brand name capital. Other confidence-producing expenditures may take the form, for example, of advertising, luxurious offices, an impressive vault, employment of responsible individuals, and payments made to a certifying or insurance agency. A competitive firm optimally invests in brand name capital by trading off these expenditures which increase the productivity of its real cash balances with the reduced real interest payments that must be made on its money to maintain a constant rental price of monetary services. On the margin an efficient investment in brand name capital (e.g., in renting a gold stock) will increase the present discounted value of the firm's profit stream by the value of the resources expended.

Under these conditions, competitive equilibrium, equation (4), is unchanged. But with information costs and the costs of creating consumer confidence, the alternative cost of holding individual monies will be greater than the marginal cost of producing the real cash balances; i.e., equation (5) no longer holds. Even if the costs of producing real cash balances were zero, the firm's average profit rate $(i - r_M)_j(M/P)_j$ will be positive and represent a return on the firm's brand-name capital.[14]

If the individual firm's brand-name capital is measured properly as a residual element earning a normal real rate of return, then the average brand name "costs" must be such as to make the net real "pure profit" zero. If the costs of producing real cash balances were zero, then zero profit implies that $(i - r_M)_j(M/P)_j - \rho\beta_j$ equals zero, or

---

the commodity, however similar it may be in physical properties to competing wares. And the difference from physical equivalent goods may be very real, in the way of confidence in what one is getting" [20, p. 185]. Also note Hayek's statement [14, pp. 96-97]: "Especially remarkable in this connection is the explicit and complete exclusion from the theory of perfect competition of all personal relationships between the parties. In actual life the fact that our inadequate knowledge of the available commodities or services is made up for by our experience with the persons or firms supplying them—that competition is in a large measure competition for reputation or good will—is one of the most important facts which enables us to solve our daily problems. The function of competition is here precisely to teach us *who* will serve us well."

[14]The cost of brand name capital, which includes the confidence created expenditures, can be thought of as the cost of "selling" (as opposed to "producing") real cash balances. The difference between what we define as "profit" and these "selling costs" can be considered to be a pure rent on the firm's brand name capital.

$$\beta_j = \left[\frac{(i - r_M)_j}{\rho}\right](M/P)_j. \tag{6}$$

The ratio of the alternative cost of holding the jth money to "the" real rate of interest (or one minus the ratio of real interest payments on the jth money to the real rate of interest) can therefore be thought of as the jth firm's brand-name capital (or net wealth) "backing" per unit of its money. If interest payments on the jth money equal the anticipated rate of change of prices in terms of the jth money (real interest payments on the jth money equal zero), then the jth firm's brand name capital equals the real quantity of its money outstanding and the firm's money can be considered to be entirely net wealth. If confidence were completely costless to produce, the value of the jth firm's brand-name capital and the net wealth value of the firm's money would vanish and competitive interest payments on its money would equal "the" market rate of interest. We would then once again be operating in a world where money supply changes were perfectly and costlessly anticipated and brand-names would be merely valueless identification marks.[15]

Given the presence of information costs regarding future money supply changes, we can no longer assume that anticipations are correct. Firms can now "deceive" consumers by increasing money faster than anticipated and it may seem at first thought that the firm's equilibrium rate of change of money is infinite.

Redefine the firm's current profit equation to take account of the fact that current actual and anticipated values are not necessarily equal. It is $(\dot{P}/P)_j^*$ which is an element of i_j and hence a determinant of the demand for the jth firm's real cash balances, but it is $(\dot{P}/P)_j$ which is the actual rate of cost to individuals of holding the jth money and $(\dot{M}/M)_j$ which is the actual rate of return to the jth firm from new money issues. Therefore, assuming that the costs of producing real cash balances are zero, the jth

[15] Harry G. Johnson [15] makes a similar distinction between competitive-interest bearing and noninterest bearing money as representing the distinction between "inside" and "outside" money. Unfortunately he identifies the equity of a commercial bank, which permits it to borrow at a rate of interest less than "the" market rate at which it lends, solely with government regulation in the money industry. But repeal of all legal restrictions would still leave some proportion of bank deposits as "outside" money if monetary services are costly to produce. Competitive interest paid by banks on deposits would remain below "the" rate of interest on assets yielding no monetary services. In Johnson's analysis, confidence is implicitly assumed to be created costlessly and therefore commodity money is merely a deadweight social cost and fiduciary money is merely a costless invention which someone happens to think of. His analysis should be correctly thought of as providing an estimate of the maximum social saving of moving from a commodity to a fiduciary monetary system. But if confidence for fiduciary money costs as much to produce as the commodity, the social saving would be zero. A reasonable explanation of why credit money did not replace commodity money before it did may not be because someone did not happen to think of the credit money idea, but rather may be because commodity money was, at the time, the cheapest way to produce confidence; i.e., a forced movement from commodity to fiduciary money would have implied a negative social saving.

firm's current real profit (or rent on its given brand-name capital) per unit time is

$$(\pi/P)_j = (i - r_M)_j (M/P)_j + [(\dot{M}/M)_j - (\dot{P}/P)^*_j] (M/P)_j. \qquad (7)$$

If we assume that there are lags in the adjustment of anticipations so that $d(P/P)^*_j / d(\dot{M}/M)_j$ is less than one, then, on the margin, an increase in the current rate of change of money increases the extent of current deceiving; i.e., $d[\dot{M}/M)_j - (\dot{P}/P)^*_j] / d(\dot{M}/M)_j$ is greater than zero, and the profit-maximizing rate of inflation would appear to be infinite.

To see this, differentiate the firm's current real profit rate with respect to the current rate of change of its money. If the demand for the firm's real money is assumed to be solely a function of $(i - r_M)_j$, which the firm is assumed to hold constant as $(M/M)_j$ is varied, then

$$\frac{d(\pi/P)_j}{d(\dot{M}/M)_j} = (M/P)_j \left(1 - \frac{d(\dot{P}/P)^*_j}{d(\dot{M}/M)_j}\right). \qquad (8)$$

If $d(\dot{P}/P)^*_j / d(\dot{M}/M)_j$ is less than one, then $d(\pi/P)_j / d(\dot{M}/M)_j$ is always positive, and therefore the firm can make its current profit rate as large as it wants by merely making $(\dot{M}/M)_j$ arbitrarily large while increasing interest payments on money to keep pace with price anticipations. The profit-maximizing rate of increase of money is therefore infinite. The money-producing firm could theoretically obtain all the wealth of its customers. The only constraint on the extent of the firm's profit rate is the existence of some rising costs of increasing $(\dot{M}/M)_j$ which places a limit on the rate at which a firm can profitably increase the supply of its money in circulation.[16]

However, this argument assumes that the money firm's brand-name capital is constant and so fails to consider the effect on consumer confidence and the firm's demand from a policy of "deceiving" customers. A major method by which a firm invests (or disinvests) in brand-name capital is by successful (or unsuccessful) performance. If the actual rate of change of money is greater than the anticipated rate, then the firm is supplying a product the quality of which is less than buyers anticipated and therefore

[16] In the antebellum banking period the head cashier of each bank was required by law to sign all bank notes. This requirement was a major constraint on the rate of increase of notes that could, in principle, be circulated by an individual bank. See Hammond [13, pp. 172-80] for a discussion of the first U.S. bank failure in 1809 and the limitation this requirement placed on the extent of the intentional overissue of bank notes that was possible. Note that I am assuming here that money producers but not consumers make the calculations implied by equations (7) and (8). If consumers also so calculated, they would know that the firm would deceive and therefore would certainly refuse to hold any money since demanding any real amount would represent a lien on all their wealth. The exchange value of each firm's money would under these circumstances necessarily be zero.

paid for. The higher the actual rate compared to the anticipated rate, i.e., the greater the extent of deceiving that is occurring, the lower will be consumer confidence. As β_j falls, $\partial N/\partial(M/P)_j$ can be assumed to fall and $(i - r_M)_j$ must also fall to keep $(P_N)_j/P_j$ constant.[17] Differentiating (7), taking account of this effect, yields

$$\frac{d(\pi/P)_j}{d(\dot{M}/M)_j} = (M/P)_j\left[1 - \frac{d(\dot{P}/P)^*_j}{d(\dot{M}/M)_j} + \frac{d(i - r_M)_j}{d(\dot{M}/M)_j}\right]. \tag{9}$$

The profit-maximizing rate of growth of money is determined at the point where

$$\frac{d(\dot{P}/P)^*_j}{d(\dot{M}/M)_j} - \frac{d(i - r_M)_j}{d(\dot{M}/M)_j} = 1. \tag{10}$$

It may seem that the profit-maximizing rate of growth of the firm's money can still be infinite. But $d\beta_j/d(\dot{M}/M)_j$, and hence $d(i - r_M)_j/d(\dot{M}/M)_j$, is partially determined by consumers. The smaller (in absolute value) an assumed given elasticity of depreciation of brand-name capital to alternative rates of monetary growth, the more brand-name capital will be demanded and the greater (in absolute value) will be $d\beta_j/d(\dot{M}/M)_j$ at alternative rates of monetary growth. Consumers can (and will) control $d(i - r_M)_j/d(\dot{M}/M)_j$ to prevent an infinite rate of growth of money. In this one-period model consumers will therefore trade off higher levels of β_j, with correspondingly higher costs of holding cash balances $(i - r_M)_j$, against higher levels of unanticipated $(\dot{M}/M)_j$. Given the production function for confidence, an equilibrium quantity of brand-name capital will be supplied and a finite rate of unanticipated inflation implied; i.e., in equilibrium the prior probability expected rate of price change distribution will have a variance.[18]

[17] This negative effect of overissuing on the market value of a money issuing firm's reputation has been noted previously. "When Philip of Valois swore the officers of his mint to conceal the debasement of the coinage and to endeaver to make the merchants believe that the gold and silver pieces were of full value, he thought that, although perhaps unprincipled, such a measure would be vastly profitable. And so no doubt believed the other kings, who, in the 'good old times,' almost universally did the like. . . . [However], the loss of their reputation for honesty made them afterward unable to borrow money, except at proportionately high rates of interest, to cover the risk ran by the lender. So that they . . . put themselves at a great disadvantage for the future" (Spencer [35, pp. 43-44].)

Note that we are assuming throughout our argument no lag in the adjustment of the firm's brand name capital to alternative rates of growth of its money. If there is a lag, i.e., *future* consumer confidence and the firm's *future* demand is decreased by a policy of *currently* deceiving consumers, then once again only the existence of costs of increasing $(\dot{M}/M)_j$ prevents the firm from inflating at an infinite rate and obtaining all the wealth of its customers.

[18] The real total payments per unit time by consumers therefore consists of two parts: $(i - r_M)_j\ (M/P)_j$ and $[(\dot{M}/M)_j - (\dot{M}/M)^*_j]\ (M/P)_j$. Given costs of unanticipated price

More generally, if the firm maximizes the present discounted value of its profit stream, rather than its current profit rate, then it must choose a $(\dot{M}/M)_j$ time path rather than a unique $(\dot{M}/M)_j$. In any case, a policy of intentionally depreciating the exchange value of its money to zero will not be wealth maximizing. The equilibrium value of the firm brand names in a particular industry and their rate of depreciation from unsuccessful performance will be determined by consumer estimates of the possible gain to producers from "deceiving." The greater the consumer estimate of the possible gain from deceiving, (e.g., the greater is the cost of detecting and reacting to less than anticipated quality), the greater the quantity of brand-name capital they will demand and pay for in a higher alternative cost, and therefore the more the firm potentially has to lose from a policy of deceiving consumers. A firm's brand-name capital is a type of collateral that it loses if it performs below anticipations.[19]

If consumers and producers make the same estimate of what can be gained by short-run deceiving then the equilibrium quantity of confidence collateral supplied will imply that wealth-maximizing firms will not inflate at an infinite rate. (If an infinite inflation rate were implied, i.e., if the absolute value of $d(i-r_M)_j/d(\dot{M}/M)_j$ never reached $1-d(\dot{P}/P)^*_j/d(\dot{M}/M)_j$, then consumers would not hold any money.) Only if the consumer estimate of the short-run profit from deceiving is less than the producer estimate will less than the equilibrium quantity of brand-name capital be demanded and supplied and will wealth maximization yield greater than anticipated deception and the possibility of an infinite inflation rate.

In a strict sense, therefore, competitive costly information equilibrium implies that all money is at least partially "commodity" money. On the margin, an unanticipated increase in the nominal quantity of a firm's money implies the real marginal (private and social) cost because of the loss of consumer confidence. In equilibrium the alternative cost to the firm of consumer confidence, in the sense of what the brand-name asset could be "sold" for to consumers via depreciation, is equal to the present value of the firm's nondeceiving "profit" stream.

---

movements consumers would prefer to make this total payment entirely in a higher $(i-r_M)_j$ with producers agreeing not to deceive at all. But, although producers should be indifferent to these two arrangements, this higher $(i-r_M)_j$ payment would not imply a high enough level of β_j to insure no deception. Under our information conditions, producers would collect this higher $(i-r_M)_j$ and still engage in some (although less) deception; i.e., such a contract would not be enforced. If confidence were costless, such a contract would certainly be fulfilled. But then deception and $(i-r_M)_j$ would both equal zero.

[19] Although the capital lost is not transferred to consumers; there is not a redistribution of wealth, as with other forms of collateral, but a net wealth loss.

III. "Competitive" Monetary Arrangements

A. Historical Examples

Historical examples of competitive producers of a single money or of different monies convertible into one another at fixed exchange rates are rare, but the available examples reveal the incentive to overissue. One major U.S. historical example of competing convertible monies is the New England colonial monetary arrangements in the first half of the eighteenth century, when separate paper money issues of each of the New England colonies (Massachusetts, Connecticut, Rhode Island, and New Hampshire) were accepted at par in each of the other New England colonies in payment of taxes and in general exchange. "This peculiar arrangement, with no central control or direction, eventually led the New England colonies to compete with one another in issuing quantities of paper money" (Lester [22, p. 7]) and produced a significantly greater depreciation of the New England monies than the monies of the middle colonies (Lester [22, pp. 7-10, 24]).

Another U.S. example of a similar competitively destructive arrangement was the requirement adopted by the Second Bank of the United States in 1816 that any branch of the Bank was obligated to redeem at par the notes issued by any other branch. This arrangement is not entirely analogous to the convertible competitive monies case since the different notes were not just convertible into one another but were also convertible into gold. However, competition did lead western and southern branches of the Bank to overissue bank notes which were redeemed in the East until the practice of redeemability of all notes at all branches was discontinued in 1818.[20]

The classic U.S. example of competitive domestic monies circulating at *flexible* exchange rates is usually taken to be the antebellum "free banking" experience.[21] Many distinguishable bank notes circulated at the time side

[20] Temin [37, pp. 31-36] discusses why bank notes normally flowed from the West and South to the East and how the monetary arrangements could therefore be abused by the western and southern branches. Rather than base the argument on the "natural" flow of bank notes, an alternative explanation could be based on the incentive by the western and southern branches to take advantage of (i.e., consume) the superior reputation of the established, more reputable, eastern branches and thereby overissue. In the short run this would cause them to experience a balance of payments deficit with the eastern branches, financed at least partially by the flow of bank notes from the West and South to the East. This incentive for the (relatively small) western and southern branches to overissue will be magnified if the redemption of bank notes is related to the size and location of a branch while bank note issuance is independent of either.

[21] "Free banking" is somewhat of a misnomer. The period was one of relatively unrestricted entry into banking. Prior to this period private banks issued their own distinguishable notes which circulated freely at varying discounts with one another.

Other historical examples of multiple monies circulating side-by-side domestically at flexible exchange rates are gold and greenbacks in the U.S. during the Civil War, foreign exchange

by side at varying discounts in terms of specie and were freely exchanged for one another by merchants and brokers in the major financial centers. These bank note exchange rates were frequently published in newspapers and in bank note reporters.[22] Monetary arrangements during the nineteenth century free banking era, however, were much closer to multiple monies circulating at fixed exchange rates than to multiple monies circulating at flexible exchange rates. The private bank notes that circulated at the time were all denominated in dollars, where "dollar" denoted a particular weight of gold. But each bank placed its particular name on its notes. That is, gold was the single dominant unit of account and all the private notes were convertible into gold at fixed exchange rates. The name of the note merely represented the probability that the particular firm would fulfill its convertibility contract. And the great majority of banking firms did normally maintain convertibility. Bank notes generally circulated at par or differed from par at a particular geographical point by the transportation costs of shipping the notes from the point of quotation to the redemption point and the costs of shipping the gold back. There were banking panics and liquidity crises, at which time all banks suspended convertibility and the discounts on all bank notes rose significantly. But universal suspension of payments was temporary, and competitive forces were such that banks had to resume payments and generally maintain convertibility or fail. The overwhelming bulk of bank notes did not generally fluctuate widely in terms of one another nor in terms of specie.[23]

Fiat or irredeemable bank notes were not generally acceptable in exchange, no matter how substantial the discount.[24] Although most state governments seldom enforced bank note gold-convertibility contracts, private competitive institutions policed convertibility and thereby kept bank notes circulating at or near par. Money brokers bought out-of-town bank notes at a discount and presented them to the issuing bank for payment in specie, and publishers of bank note reporters and counterfeit detectors kept individuals informed about the market value of different bank notes together with a description of counterfeit, altered, and spuriously signed notes. In addition, banks would demand payment in specie for the notes of competing banking firms

---

and marks in Germany after World War I, imperial rubles and revolutionary rubles in Russia after World War I, ordinary currency and special new currency issues in times of hyperinflation, and silver and copper in China from about 1650 to 1850. All of these examples, except the flexible bimetallic exchange rates in China, were temporary arrangements which existed for brief critical periods and should be considered exceptional.

[22] One of the earliest issues of a bank note reporter, dated 1830, listed the current New York City quotation of the discount rate in terms of gold on approximately five hundred different bank notes together with historical information on the reliability of particular banks (Dillistin [8, p. 99]). An analogous, highly reputable, service for nearly one hundred different national currencies is currently provided by Franz Pick [32].

[23] For sketchy evidence on the general level and movement of nineteenth century bank note discounts, see Van Fensternmaker [40, pp. 77–95], Berry [2] and Macesich [24].

[24] The bank notes of Kentucky and Tennessee were relatively unimportant exceptions. (Van Fensternmaker [40, p. 95]).

they received, and many banks became members of private protective and certifying agencies, which performed some functions similar to present-day central banks.[25]

B. Multiple Monies Convertible into a Dominant Money

The foregoing monetary arrangement will be called a "dominant" money arrangement. It is an arrangement where all money producers maintain convertibility on demand of their distinguishable monies at a one-to-one fixed exchange rate into a single (dominant) money which serves as the unit of account. The dominant money supplier does not maintain convertibility of his money into any other money. It is a *one-to-one* fixed exchange rate arrangement based on *one-way* convertibility agreements. This monetary arrangement implies that all the monies must inflate at the same rate as the dominant money, but it does not eliminate the possibility of competition between the different monies via interest payments. Competitive equilibrium will still imply that all (nondominant) monies pay a real rate of interest equal to "the" real rate of interest minus the marginal costs of producing a unit of real cash balances.

The unique inflation rate is determined by changes in the supply of the dominant money, and, given the one-way convertibility arrangements, there appears to be an incentive for a profit-maximizing dominant money supplier to overissue. It is therefore claimed that a competitively determined dominant money must be a commodity money. This argument, however, ignores the fact that the dominant money-producing firm will lose wealth (and its dominant position) if it overissues. But since the possible short-run gain to an established dominant money supplier from overissuing is enormous (see fn. 41), a competitively determined dominant money will possess a very valuable brand name and sell, in nondeceiving equilibrium, at a high alternative cost. This necessary brand-name backing implies that the money is, in a sense, "commodity" money.

Present U.S. domestic monetary arrangements can usefully be described

[25] Biddle is sometimes said to have performed the valuable social service of preventing unlimited inflation by returning all notes received by the Second Bank of the United States to the issuing bank for redemption. This far-sighted social policy conveniently coincided with profit maximization by the Second Bank and a similar policy was also followed by many nonfederally chartered private banks.

Very early in our banking history, firms joined cooperative associations, similar to what later became Clearing Houses, to sustain each others notes and demand payment from nonmembers. The Suffolk Bank of Boston provided this service very efficiently in New England from 1818-66 and redeemed on demand the notes of the banks that did not maintain a balance at the Suffolk Bank. Formal Clearing Houses were established in New York in 1853, in Boston in 1856 and in Philadelphia in 1858 and provided the particularly valuable service of examining member bank accounts and publishing the information. In this way individual banks were prevented from overissuing, even in times of general restriction of payments. (Cf. Hammond [13, pp. 705-6]. Temin [37, p. 117] discusses a similar cooperative action in the pre-Clearing House period).

in terms of this model of multiple monies convertible into a single dominant money at fixed exchange rates. There is one dominant money (currency supplied by a government monopoly) and many privately produced nondominant monies (deposits supplied by different commercial banks). All the private monies are denominated in the same units as the government's money and legally convertible into the government's money by the private money issuers. Given the general acceptance of the different monies at fixed exchange rates, the governmental intervention which prevents the money supply and the price level from approaching infinity is the strict enforcement of the requirement that the private monies be convertible into the government money; it is independent of any legal or economic reserve requirements. Even if commercial banks held no reserves of the dominant money, enforcement of the requirement that each bank maintain convertibility of its money into the dominant money will imply that the total money supply and the price level is determined by the government supply of the dominant money and consumer preferences among the different monies. As long as there is some demand for the government's dominant money, commercial bank reserve requirements are unnecessary for a determinate finite price level.[26] Legal reserve requirements appear in this context to constitute merely an excise tax on private money production, if less than a competitive rate of interest is paid on the government money held by private banks. And as long as the convertibility requirement is present, even government monopolization of the supply of currency is unnecessary for a finite equilibrium price level; monopolization appears in this context to represent merely nationalization of a particular industry. From this perspective the crucial distinguishing characteristic of present U.S. monetary arrangements is the legally imposed convertibility requirement that ties all the monies at fixed exchange rates to a governmentally supplied dominant money.[27]

C. Information and Transaction Costs

Flexible exchange rates between monies in a domestic money market has not been a common historical experience. Even when a legal fixed

[26]Our analysis here, that the existence of distinguishable monies on the demand side combined with a convertibility requirement on the supply side places a limit on the nominal quantity of non-dominant monies, is analogous to the analysis in Tobin [39].

[27]Pesek and Saving are among the few economists who explicitly assume that this convertibility requirement is a necessary characteristic of monetary institutions and call the requirement an "instant repurchase clause" [30, p. 80]. Pesek and Saving do not explicitly define dominant money other than to say that it is "the coin of the Realm" and beg the important question of whether dominant money must necessarily be supplied by the government.

It is interesting to note that Pesek and Saving's stated intention is to analyze money with the standard economic tools used in analyzing any economic good. This, however, is the second legally imposed institutional arrangement upon which their analysis is based; the first was the prohibition of interest payments on money (see fn. 7 above).

exchange rate requirement has been absent, private contractual relationships achieved the same result. Monetary arrangements have almost always consisted of a single money or of multiple monies convertible into a single dominant money.[28] To explain the almost universal existence of fixed exchange rate monetary arrangements, we must explicitly consider the information and transaction costs of competitive multiple independent monies. The reasons why such a monetary arrangement appears not to be viable are related to the theory of optimal currency areas.

Our competitive model, with many distinguishable monies circulating side by side at flexible market-determined rates, is essentially equivalent to the complete absence of any currency area. Mundell [27], in his original formulation of the optimum currency area problem, argues that "the costs of valuation and money changing tend to increase with the number of currencies." If there are many monies and many sets of prices, the unit of account and medium of exchange functions of money are hampered. Money exchange rates are now necessary to determine relative values, and there are now the added transactions costs involved in currency conversions. These computational-conversion costs increase with the number of independent monies within a market. However, money changing and valuation costs are present even if the different monies are tied together at fixed exchange rates; their magnitude depends on the specific form of the fixed exchange rate arrangement adopted. The smaller the number of different fixed exchange rates, the lower these transaction costs will be. If, for example, the fixed exchange rates between all the monies are one to one, then the different monies would essentially be denominated in the same units and the computational-conversion costs would be substantially eliminated. Minimization of money changing and valuation costs implies a single currency, not a single currency area, and in a multiple money context is an argument not merely for fixed exchange rates but for a dominant money arrangement with its uniform unit of account.

McKinnon [26] extended Mundell's analysis by considering the store of value function of money and the costs of future price level uncertainty. McKinnon assumed that the maintenance of stability of a money's value in terms of a representative bundle of economic goods reduces these costs and facilitates efficient resource allocation. If the producer of every distinguishable currency maintains a stable price level in terms of its currency of essentially the same bundle of goods, then "each currency will be pegged to the other" [26, p. 722].[29]

[28] Cipolla [7, ch. 2] documents the fact that dominant monies existed over large areas and long time periods as early as the fifth century when the Byzantine gold solidus had a dominant position throughout the Mediterranean.

[29] This conclusion is misleadingly stated. Given the assumptions, exchange rates between the competing monies will remain unchanged. But we must distinguish between *constant* market exchange rates and convertibility of currencies at unchanging *fixed* or pegged exchange rates. McKinnon implicitly recognizes this distinction and the inherent continuum between

But the crucial information costs reducing characteristic of monetary arrangements is the *predictability* of exchange rate changes. Similarly, it is the *predictability*, and not necessarily the stability, of prices in terms of a money which reduces information costs and provides store-of-value liquidity services. There is therefore no theoretical reason to expect even constant exchange rates between competing monies to be an optimal solution. Stability may facilitate prediction; but consider the possibility of a monetary arrangement where each individual money were inflating at a different perfectly stable (and predictable) *rate* and money exchange rates were changing at a stable (and predictable) rate.

More important, these information cost considerations argue for fixed exchange rates, but not necessarily for a dominant money. To explain the existence of a dominant monetary arrangement we must more carefully consider the nature of the production function for consumer confidence. Significant economies of scale probably exist in the production of information about reliability of a money.[30] In addition, the costs of disseminating information about a particular industry are smaller the smaller the number of independent firms in the industry. The greater the homogeneity of products in an industry, the smaller the variance of the anticipated quality distribution in the industry (cf. Alchian [1, p. 124]). Since information about anticipated quality (predictability of prices) is a major determinant of the monetary-service flow from a money, we can therefore expect these considerations to be paramount and the value of a single quality product in the industry to be substantial.

D. International Monetary Implications

There are implications of this analysis for the international money market, where confidence remains as a significant problem and where different countries supplying distinguishable monies can usefully be thought of as

---

monetary exchange rate systems categorized as fixed and those categorized as flexible when he states that to "maintain the liquidity value of individual currencies for small areas," the currencies must be pegged "convincingly." The coincidental historical maintenance of stable prices in terms of many different monies does not imply that the currencies are "convincingly pegged" together and part of a single currency area. Given information costs, the distinction between fixed and flexible exchange rates hinges upon *anticipations* concerning *future* exchange rate changes. A currency area can be meaningfully defined as an arrangement where the probability of an exchange rate change between currencies is essentially zero. Exchange rates between two currencies may be legally "fixed," but the anticipated probability of an exchange rate change can be significant. Present (1970) international monetary arrangements among the major currencies should be thought of as lying much closer to the flexible exchange rate than to the fixed exchange rate benchmark. Frequent devaluations in the past have significantly increased consumer estimates of probability of future exchange rate changes and forward rates, which are highly significant for international trade, are frequently outside the "guaranteed" band of the spot rate.

[30] "Since the cost of collection of information is (approximately) independent of its use (although the cost of dissemination is not), there is a strong tendency toward monopoly in the provision of information; in general, there will be a "standard" source for trade information" (Stigler [36, pp. 181-2]).

analogous to competing firms in an unregulated money industry. Present (1970) international monetary arrangements are often described as being (or moving toward) a fixed exchange rate dollar standard system—with all monies tied to the dominant U.S. dollar. This arrangement is based not on any regulation but on the dollar's valuable brand name. There is open entry into the dominant international money business and we can expect the dollar brand name to depreciate if the dollar's performance is unexpectedly poor. This essentially is the balance of payments constraint under which the United States is currently operating. The profit or "seigniorage" currently being earned on foreign holdings of high-powered dollars should be thought of as payment by foreigners for the use of the U.S. confidence and as a normal return on the dollar brand-name capital. On the margin the alternative cost to the owners of the dollar brand-name capital of an unanticipated increase in the quantity of dollars is the decrease in the value of the brand-name capital and hence future profit stream that can be earned.[31]

International monetary reform is now seen to be closely related to the transaction-information costs associated with multiple money exchange arrangements. If the dollar is the dominant international money, the adoption of flexible exchange rates may substantially reduce the monetary services yielded by a given real quantity of nondollar monies and result in increased holdings of dollars and dollar denominated assets. This would increase the real value of the U.S. dollar's brand name. However, the dollar's dominant position is not completely secure and flexibility may in fact create a competitive dominant money (e.g., the mark) or group of monies and decrease the international demand for dollars. Therefore, *if* U.S. monetary authorities were attempting to maximize the value of the dollar brand name capital, it is unclear whether they should support a movement towards greater flexibility at this time.

But what is difficult to understand in this context is the advocacy by U.S. authorities of the creation of SDRs, a new competitor for the dollar in the international money business. This does not appear to be a policy that would increase the demand for dollars and hence the value of the dollar brand-name capital.[32] A possible explanation for the U.S. government's behavior is that it is hoping SDRs will reduce the monetary usefulness of gold, an important competitor of the dollar, while not displacing

[31] Estimates of the current profit (return on brand-name capital) being earned on the dollar should not assume that confidence capital necessarily has a zero cost of creation and maintenance (as, e.g., Grubel [12] and Johnson [17] do).

[32] Discussions of the creation of "paper gold" have often implicitly assumed that the IMF has unlimited brand name capital. A stationary equilibrium measure of the IMF's limited brand name capital can be obtained by multiplying the difference between "the" market interest rate and the rate that is paid on SDR's by the real value of the SDRs "in circulation" (the quantity effectively demanded, i.e., voluntarily held by countries in payment for a balance of payments surplus—not IMF "allocations"). And even this finite value of the brand name of SDR's is based, to some extent, on the willingness of the U.S. to accept them.

foreign dollar holdings. Another possible explanation is that the U.S. monetary authorities want to decrease foreign dollar holdings because they do not recognize that to a large extent the postwar increase in foreign holdings of dollar assets has resulted from the relative rise of the dollar brand name. If monetary services were considered to be a good, voluntary increases of dollar holdings by foreign individuals and governments should be recognized as exports and not as a balance of payments "deficit." Going one step further, even "involuntary" holdings of dollars may represent payment by foreign governments for U.S. protection and other services. The only economic definition of a "deficit," other than upward pressure on the foreign exchange rate, involves the depreciation of the brand name of a money—i.e., the use (or "sale") by a government of some of its brand name capital in international exchange. Long-term movements in U.S. foreign exchange rates "unexplained" by relative inflation rates may therefore be due to appreciation or depreciation of the dollar's brand name as an international currency.

IV. Government Intervention in the Money Industry

The transaction and information cost effects considered above suggest some reasons for the existence of monetary arrangements where individual monies are convertible at a fixed one-to-one exchange rate into a dominant money. But we have not yet specified the efficient role of government within such monetary arrangements. U.S. history suggests that contracts guaranteeing convertibility into a single dominant money will arise and generally be honored under conditions of free unregulated competition. What peculiarities of money, then, justify present government intervention (*a*) to supply the dominant money and require all private monies to maintain convertibility, (*b*) to require producers of private monies to maintain reserves in the government money, and (*c*) to monopolize the supply of currency? We will now discuss some possible rationalizations for this intervention.

Money differs from other durable consumer goods in the importance of its resale value as a determinant of its service flow. As a result, future supply and demand significantly affects the quality of money an individual purchases now.[33] This characteristic of money plus the fact that fraud

[33] This property may be considered unique to money. Although the current cost of other durable goods may be related to their future resale value, the real (non-liquidity) service flow from other goods is independent of their exchange value. The service flow from a money, on the contrary, is related solely to its market exchange value. An individual may, for example, consider a refrigerator to be of very high quality and be correct—independent of how anyone else values the refrigerator, while an individual's estimate of the quality of a money that completely disagrees with the market estimate must be incorrect. If everyone thinks a money is worthless, it necessarily is and therefore yields no monetary services. Increased future supply of other durable goods will decrease the value, *but not the quantity*, of the service flow yielded by goods currently purchased.

(unanticipated changes in the quantity of a firm's money) is costly to detect and react to in the money industry implies that consumer confidence and therefore firm brand names are of exceptional value relative to other inputs in the money industry. Gains from government intervention, however, are not yet implied.

Government control of the supply of dominant money may be related to macroeconomic stabilization policy. If a government is to engage in monetary policy, it must be able to control the supply of (or demand for) dominant money. If a private producer supplies the dominant money into which the government's money is convertible, then a government cannot inflate at a rate different from that of the dominant money. But this loss of domestic money supply control refers only to the long-run secular rate of change of money. A government can always engage in short-run stabilization policy by inflating at a rate greater than (or less than) the dominant money's, thereby losing (or gaining) reserves of dominant money. The only added cost to a government is the inventory costs of holding reserves of the privately supplied dominant money.

Alternatively, the government may supply the dominant money because of natural monopoly characteristics of the industry. Given declining costs of supplying information, a single firm or private trade association would be efficient in producing confidence for a group of monies. The monopolistic or cooperative association could provide a dominant money and implicit or explicit insurance to consumers of member firms, similar to the use of warranties for other durable goods. However, such an arrangement increases distinguishability costs and therefore the incentive for individual member firms to overissue and consume the brand-name capital of other firms in the association. The association would therefore have to assume some control over member firm production decisions to internalize what would otherwise by unheeded externalities. If any firm in the money industry can take advantage of general consumer confidence and significantly damage the reputation of other producers, the economic forces for compulsory membership and highly regulated or monopolistic organization will be magnified. But other industries that are natural monopolies often lead to governmental franchises and public regulation instead of governmental monopoly production.

Perhaps governmental monopoly of the supply of dominant money, rather than regulated private production, is based on a governmental advantage in supplying confidence. If indeed such an advantage exists, then the government would control production of the dominant money even if entry into the industry were permitted. But such an advantage should not be assumed to exist for all governments at all times. Before 1933 the U.S. government was promising to convert on demand its money into a private competitively produced money—gold. Rather than always having a monopoly in the supply of monetary confidence, historically governments entered

the money business to supply legal sanction (and at times certification) to preexisting privately developed monetary arrangements.[34] And although private producers have taken advantage of the confidence placed in their monies, it is difficult to find a government that has not betrayed consumer trust.[35]

If some governments do have a cost advantage over private firms in producing monetary confidence, we must still determine *what* enables them to be more efficient. It is sometimes asserted that the advantage is based on the government's coercive power, for example, the governmental ability to declare its money "legal tender."[36] But this authority is neither necessary nor sufficient for the supply of monetary confidence[37] and may not even be important. The designation "legal tender" means that debtors cannot legally refuse the money as payment and amounts to the assertion by the government that individuals may use the government courts and police to force acceptance of its money in discharge of debts.[38] But this unique legal sanction possessed by the government's money in the enforcement of contracts may not even be a crucial attribute. Macauley [23] provides evidence that relatively informal legally unenforceable contractual practices predominate in business and that reliance on explicit legal sanctions is extremely rare. Business firms are said to generally rely on effective nonlegal sanctions, such as the appreciation or depreciation of a firm's goodwill from fulfillment or nonfulfillment of contracts.

Another possible advantage for the government may be that the production of monetary confidence is highly complementary with the production of

[34] "The first attempts to secure confidence of metallic money came from private individuals, bankers, goldsmiths, or great merchants who imprinted on the metals their particular marks" (Laughlin [21, p. 47]). For historical evidence of the role of government in the development of money see Burns [3, chs. 4 and 17], Carlile [5] and Nussbaum [28, pp. 32-45].

[35] Examples of private "abuses" are very well known. Examples of private reliability in the supply of money are not sensational or newsworthy and therefore are less well known. An outstanding example of a reliable private money in the U.S. was George Smith money. It was issued by the Wisconsin Marine and Fire Insurance Co. and was the major money in circulation in the Midwest during the 1840s. (See Hammond [13, pp. 613-14]). Government depreciation of monetary confidence occurred as long ago as the third century B.C. with the intentional debasement of metallic coins. (Laughlin [21, pp. 61-68]).

[36] The most extreme version of this assertion states that money is merely what government declares it to be and can be traced back to Knapp [19] who begins his book: "Money is a creature of law. A theory of money must therefore deal with legal history." Menger [25, p. 255], on the other hand, notes that "Money has not been generated by law. In its origin it is a social, and not a state-institution." Von Mises [41, pp. 68-78] and Nussbaum [28, pp. 5-10] also believe that it is the voluntary usage in commercial transactions based on the custom and confidence of the people that makes things money.

[37] There is overwhelming historical evidence on the existence of nonlegal tender circulating monies (and nonmonetary legal tenders); cf. Nussbaum [28, pp. 508, 46-48 and 54-55]. Federal Reserve notes, for example, were not made legal tender until 1933.

[38] See, for example, Nussbaum [28, pp. 45-55]. Alternatively, the government may only legally obligate itself to accept its money as payment for taxes. (The money is then said to possess "public receivability"; cf. Nussbaum [28, pp. 57-58]). But, for example, Ford Motor Company, if it were a private supplier of money, could similarly guarantee that its money would always be acceptable in payment, for example, of Ford cars. These promises amount to very little and are not analogous to guaranteed convertibility of a money into a commodity since the price of the Ford or the taxes is not fixed in terms of the money.

other goods that the government generally supplies. The production of national defense, for example, may be complementary with supplying monetary confidence. Positive technical externalities appear to go both ways; i.e., production of national defense not only yields some monetary confidence as a by-product, but production of monetary confidence also yields national defense services. Control of a country's dominant money supply carries with it the ability to quickly gain control of a significant quantity of the country's resources. To a government such control represents a very large potential tax that can quickly be levied and collected in a broad based and efficient way—without market or democratic tests. If the government holds its coercion capital in such a highly liquid form the asset can then be conveniently used for national defense purposes. England, for example, exhausted a large part of the pound sterling brand-name capital, built up over more than two centuries of successful performance, to fight World War II.[39]

Governmental depreciation of its monetary confidence asset to fight a war points up a peculiar difficulty with governmental control of money production. Government officials do not own the monetary brand-name capital and therefore have less incentive to conserve it. They will more generally tolerate its destruction to maintain their political power than would owners of a private firm. The creation of stable price expectations appears to be such a long-term investment that politicians, particularly those whose positions are not secure, will not undertake its current costs and will consume inherited brand-name capital.[40]

The U.S. has attempted to create institutions in which semi-independent officials control the money supply. These officials are subject to less immediate political pressure and therefore have less short-run incentive to inflate and consume monetary confidence capital than do elected officials. Present U.S. monetary arrangements also attempt to separate individuals who control the dominant money supply from the beneficiaries of the income earned on the dollar brand-name capital. If competitive interest

[39] Intentional monetary depreciation during wars appears, at first glance, to be rational governmental policy in that we would expect it to be optimal to use on the margin some of all forms of a nation's wealth, including monetary confidence capital. But the loss of brand-name capital is a social cost that accompanies the transfer of wealth from money consumers to money producers and this cost must be explicitly taken account of when considering the efficiency of various taxes. If foreigners hold some of the money then unanticipated inflation produces more than merely a redistribution of wealth among citizens of the country; it yields the country additional net resources for current use. Therefore the decision by England after World War II to adopt a policy of devaluation with a resulting loss of brand-name capital rather than a policy of decrease in the rate of growth of money to "repay" the borrowings it made against its brand-name capital during the war (when it credited foreign accounts at the Bank of England in exchange for resources) may have been rational.

[40] Throughout this discussion we are assuming that political power is not an endowed saleable asset. If government officials possessed private property rights to their political power, they would experience a wealth loss if they depreciated monetary brand-name capital and the incentive to overissue would be reduced.

payments are made by private financial institutions, then solely the Federal Reserve earns income on the dollar brand-name capital, which it then passes on to the Treasury as "interest" on Federal Reserve notes. The short-run incentives for overissue are thereby reduced compared to direct governmental control. But, still, Federal Reserve officials do not have private property rights to the confidence capital embodied in the dollar brand name and therefore the arrangement is less effective in this respect than a private property right arrangement.

Alternatively, if the government were to regulate a private dominant money supplier, many of the beneficial incentive effects from private ownership of brand-name capital would still vanish. If the government does not permit the firm to set a profit-maximizing rental price for the dominant money, the private firm will have an incentive to overissue. Given the natural monopoly characteristics in the production of monetary confidence and the costs of switching to a new dominant money, we can expect the profit-maximizing price in a nondeceiving equilibrium to be very high.[41] If the government is to prevent the firm from setting such a high price and also from overissuing, regulation must include price and quantity and the situation is closer to public ownership.

None of the arguments we have considered justify legal monopolization by the government of the supply of currency. Furthermore, although all dominant monies may in fact have to be currencies, all currencies need not be dominant monies. Why should not the government allow many different private currencies to circulate, all convertible on demand into the government's dominant currency (as with travelers checks)? A possible answer is related to the efficiency that one currency permits in prevention of counterfeiting. During the free banking era, counterfeit bank notes were a more significant problem than the fraud associated with overissue and bank failures. The entry into the market of additional currencies creates social information-transaction costs associated with detecting counterfeits and therefore a single currency must be established.[42]

[41] An indication of the costs of switching to a new dominant money is the continued use of the established money within a country during a hyperinflation, even though regulations against the use of foreign currencies often did not exist. Cagan [4] notes that of the seven hyperinflations he studied only in 1923 Germany did substantial amounts of unauthorized currencies issued by local governments and private organizations circulate, and these illegal currencies were denominated in the hyperinflating unit (p. 101). His estimates of the constant (anticipated) rate of change in the quantity of money and prices that would maximize the government's revenue ranged from 12 to 54 percent *per month* (p. 81).

[42] Small denomination notes were particularly easy to counterfeit and difficult to control during the free banking period since it did not pay to examine them carefully, and some states therefore prohibited their issuance (cf. Gallantin [10, p. 301], Hammond [13, p. 186] and Temin [37, p. 188]). The Bank of England did not issue notes under £20 until 1759 and bank notes were not commonly used in everyday exchange but circulated primarily between specializing money dealers (cf. Smith [34, pp. 306-8]). An interesting fact that may provide some evidence on the reduced costs of preventing counterfeiting when only a single major currency exists is that Bank of England paper notes circulated for 64 years before the first counterfeit appeared while counterfeits appeared in the U.S. soon after paper money was introduced (Dillistin [8, p. 10]).

These conjectures about present domestic monetary arrangements await verification in future research on the fundamental unanswered questions regarding the nature of the monetary service stream and the production function for monetary confidence. An increase in our understanding of the economic attributes of money and its role in facilitating exchange combined with knowledge of the historical development of monetary brand names and the part government played in the process is essential before we can hope to determine the optimal set of institutions and government regulations for the money industry.

LITERATURE CITED

1. ALCHIAN, ARMEN A. "Information Costs, Pricing, and Resource Unemployment." *Western Economic Journal*, 7 (June, 1969), 109–28.
2. BERRY, THOMAS S. *Western Prices Before 1861*. Cambridge: Harvard University Press, 1943.
3. BURNS, ARTHUR R. *Money and Monetary Policy in Early Times*. New York: Knopf, 1927.
4. CAGAN, PHILLIP. "The Monetary Dynamics of Hyperinflation." In Milton Friedman, ed., *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press, 1950. PP. 25–117.
5. CARLILE, WILLIAM W. *The Evolution of Modern Money*. London: Macmillan, 1901.
6. CHAMBERLIN, EDWARD H. *The Theory of Monopolistic Competition*. 8th ed. Cambridge: Harvard University Press, 1965.
7. CIPOLLA, CARLO M. *Money, Prices and Civilization in the Mediterranean World: Fifth to Seventeenth Century*. New York: Gordian Press, 1967.
8. DILLISTIN, WILLIAM H. *Bank Note Reporters and Counterfeit Detectors*, 1826–1866. New York: The American Numismatic Society, 1949.
9. FRIEDMAN, MILTON. *A Program for Monetary Stability*. New York: Fordham University Press, 1959.
10. GALLATIN, ALBERT. "Considerations on the Currency and Banking System of the United States," (1831) in H. Adams, ed., *The Writings of Albert Gallatin*, vol. 3. Philadelphia: Lippincott, 1879. Pp. 231–364.
11. GOLDMAN, MARSHALL I. "Product Differentiation and Advertising: Some Lessons from Soviet Experience." *Journal of Political Economy*, 68 (August, 1960), 346–57.
12. GRUBEL, HERBERT G. "The Distribution of Seigniorage from International Liquidity Creation." In R. A. Mundell and A. K. Swoboda, eds., *Monetary Problems of the International Economy*. Chicago: University of Chicago Press, 1969. Pp. 269–82.
13. HAMMOND, BRAY. *Banks and Politics in America from the Revolution to the Civil War*. Princeton, N.J.: Princeton University Press, 1957.
14. HAYEK, FRIEDRICH A. "The Meaning of Competition." In *Individualism and Economic Order*. Chicago: University of Chicago Press, 1948. Pp. 92–106.

15. JOHNSON, HARRY G. "Inside Money, Outside Money, Income, Wealth, and Welfare in Monetary Theory." *Journal of Money, Credit, and Banking*, 1 (February, 1969), 30-45.

16. _____. "Pesek and Saving's Theory of Money and Wealth: A Comment." *Journal of Money, Credit, and Banking*, 1 (August, 1969), 535-37.

17. _____. "A Note On Seigniorage and the Social Saving from Substituting Credit for Commodity Money." In R. A. Mundell and A. K. Swoboda, eds., *Monetary Problems of the International Economy*. Chicago: University of Chicago Press, 1969. Pp. 323-29.

18. KLEIN, BENJAMIN. "The Demand for Quality Adjusted Cash Balances." Unpublished manuscript.

19. KNAPP, GEORGE FRIEDRICH. *The State Theory of Money*. London: Macmillan, 1924.

20. KNIGHT, FRANK H. *Risk, Uncertainty and Profit*. 1921; rpt. New York: Kelley, 1964.

21. LAUGHLIN, J. LAWRENCE. "A New Exposition of Money, Credit, and Prices," vol. 1, *The Evolution of the Standard*. Chicago: University of Chicago Press, 1931.

22. LESTER, RICHARD A. *Monetary Experiments: Early American and Recent Scandinavian*. Princeton: Princeton University Press, 1939.

23. MACAULEY, STEWART. "Non-Contractual Relations in Business: A Preliminary Study." *American Sociological Review*, 28 (February, 1963), 55-69.

24. MACESICH, GEORGE. "Monetary Disturbances in the United States, 1834-45." Unpublished Ph.D. dissertation, University of Chicago, June, 1958.

25. MENGER, KARL. "On the Origin of Money." *The Economic Journal*, 2 (June, 1892), 239-55.

26. MCKINNON, RONALD I. "Optimum Currency Areas." *American Economic Review*, 53 (September, 1963), 717-25.

27. MUNDELL, ROBERT A. "A Theory of Optimum Currency Areas." *American Economic Review*, 51 (September, 1961), 657-65.

28. NUSSBAUM, ARTHUR. *Money in the Law: National and International*. Brooklyn, N.Y.: Foundation Press, 1950.

29. PESEK, BORIS P. "Comment." *Journal of Political Economy*, 76 (August, 1968 supplement) 885-92.

30. PESEK, BORIS P., and THOMAS R. SAVING. *Money, Wealth and Economic Theory*. New York: Macmillan, 1967.

31. _____. *The Foundations of Money and Banking*. New York: Macmillan, 1968.

32. PICK, FRANZ. *Pick's Currency Yearbook*. New York: Pick Publishing Corporation, annually.

33. ROTHBARD, MURRAY N. "The Case for A 100 Percent Gold Dollar." In Leland B. Yeager, ed., *In Search of a Monetary Constitution*. Cambridge: Harvard University Press, 1962. Pp. 94-136.

34. SMITH, ADAM. *An Inquiry Into the Nature and Causes of the Wealth of Nations*. 1776; rpt. New York: The Modern Library, 1937.

35. SPENCER, HERBERT. *Social Statics*. 1877; rpt. New York: Robert Schalkenbach Foundation, 1954.

36. STIGLER, GEORGE J. "The Economics of Information." In *The Organization of Industry*. Homewood, Ill.: Irwin, 1968. Pp. 171-90 (Reprinted from *Journal of Political Economy*, 69 [June 1961]).

37. TEMIN, PETER. *The Jacksonian Economy*. New York: W. W. Norton, 1969.

38. THOMPSON, EARL A. "The Theory of Money and Income Consistent with Orthodox Value Theory." Unpublished manuscript.

39. TOBIN, JAMES. "Commercial Banks as Creators of 'Money'." In Dean Carson, ed., *Banking and Monetary Studies*. Homewood, Ill.: Irwin, 1963. Pp. 408–19.

40. VAN FENSTERNMAKER, J. *The Development of American Commercial Banking, 1787–1837*. Kent, Ohio: Kent State University, 1965.

41. VON MISES, LUDWIG. *The Theory of Money and Credit*. New Haven: Yale University Press, 1953.