The Scope and Limits of Futures Trading

H. S. HOUTHAKKER

The economic analysis of institutions is not highly regarded or widely practiced among contemporary economists. The very word “institution” now carries unfavorable associations with the legalistic approach to economic phenomena that was respectable during the first three decades of this century. There is little reason to regret the triumphant reaction that swept institutionalism from its dominant place. Nevertheless, economics can still learn much from the study of institutions. The analytical problems that arise are often both a challenge to conventional theory and a useful reminder of the relativity of accepted doctrine.

The subject of the present paper is futures trading in commodities. It does not go into technical details, nor does it present empirical evidence. Its aim, rather, is to investigate from a theoretical standpoint why futures markets exist at all and why they exist only for a rather small number of commodities. Because of the intimate connection between futures contracts and inventories much attention is paid to the analysis of the latter, particularly in Sections I and II. The effects of uncertainty are discussed in Section III, while Section IV is devoted to the heterogeneity of the cash market. Section V sketches the development of futures trading, and Section VI relates this to hedging. Section VII brings together the strands of the argument.

I. FOUR TYPES OF STOCKS

The stock of a commodity at a certain time is the difference between the total quantity produced up to that time and the total disappearance up to that time. The change in stocks during the period between two dates is, therefore, equal to the difference between production and consumption during that period. If the quantities produced and consumed during a

1 This paper results from continuing research on commodity markets initially undertaken with the support of the Cowles Commission (now Foundation) for Research in Economics, under a grant from the Rockefeller Foundation. I am much indebted to Arthur M. Okun for valuable comments.

2 Although consumption is not the only form of disappearance, destruction being another form, we shall often use “consumption” and “disappearance” syn-
period are equal, stocks do not change, and if production and consumption have been equal at all times, stocks must be zero.

There are few commodities of which stocks are always zero (services and electric power are the most conspicuous examples), and not many more of which stocks do not change over time (e.g., natural gas in a pipeline). Of all other commodities, therefore, production does not always equal consumption. The main reasons that differences between production and consumption occur are the following:

1. The cost of production may not stay the same over time; more particularly, it may vary as a result of natural causes. Thus, it is cheaper to enlist the aid of sun and rain to grow wheat that can be harvested in the summer and stored until it is consumed than to build hothouses from which wheat can be obtained as it is needed. Similarly it is economical to reserve some wheat from an abundant crop for use in subsequent years in which nature may be less benevolent.

2. If production costs per unit depend on the maximum rate of output, and if demand changes over time, storage may help to even out production and thereby reduce costs. Thus, the demand for toys has a peak at Christmas, but the capacity of the toy industry can be kept down, so that unit costs will be lower, if production is spread out over the whole year and the output stored.

3. Large quantities may cost less per unit than small quantities, and it may then be cheaper to obtain large quantities at intervals and store them until they are used up. This factor is particularly important in distribution.

4. Differences between production and consumption may finally emerge against original intentions rather than on any of the efficiency grounds mentioned previously. Production may have been planned to equal estimated consumption, for instance, but, because of favorable weather, production may exceed the plan, or consumption may fall short of the estimate. Storage is then one way of taking care of the surplus.

In each of these four cases a crucial role is played by the carrying costs, which comprise the total outlays necessary for holding stocks. Carrying costs have three components: the cost of storage in the narrow sense (warehouse and insurance charges), the loss (if any) due to spoilage and deterioration, and the interest on the investment which stocks represent. a The second component may actually be negative for commodities which improve with age, such as wine; total carrying costs may then also be negative, and stockholding correspondingly stimulated. Disregarding this

---

a Onymously. Note also that "production" and "consumption" will throughout be used in a technological sense: by "producers" of wheat, for instance, we mean farmers and not merchants or shippers; the "consumers" of wheat are flour millers and not households.

a The cost of hedging (if any) will not be regarded as part of the carrying cost.
case, however, it is evident that in the first three cases mentioned above any advantage in production cost must exceed the carrying cost if storage is to be efficient. In the fourth case the carrying cost will have to be less than the expected increase in value between the time the commodity is put into storage and the time it is taken out.

II. SEASONAL AND CARRY-OVER STOCKS UNDER PERFECT FORESIGHT

Of the four cases of a difference between production and consumption, the first and the last are the most relevant to the staple commodities with which this paper is concerned, though the third case will also be referred to occasionally. Let us, therefore, consider the first case separately to begin with, under the assumption that the future is predictable with certainty.⁴ Evidently the fourth case (unplanned stockholding) is not consistent with the latter assumption, and we must therefore exclude it for the time being. The second and third cases are compatible with perfect foresight, but they will also be disregarded. It should be added that the hypothesis of perfect foresight may lead to absurd results when pushed to extremes, but for the present limited purpose it is harmless enough.

Suppose first that there are no year-to-year changes in the weather, all climatic variations being seasonal in nature, that production and consumption depend only on the price of the commodity considered, and that the entire production becomes available at one instant, whereas consumption is spread out (not necessarily evenly) over the year. If the price (except for seasonal variations) stays the same year after year, annual production and annual consumption will each remain on the same level from year to year, and there will be one price (again apart from seasonal variations) at which annual production and annual consumption are equal. There will then be no carry-over;⁵ the only stocks held are those necessary to distribute the annual crop over the crop year. At any time these seasonal stocks must therefore be equal to the total consumption during the remainder of the crop year. This total subsequent disappearance, which itself depends on the prices charged during the rest of the year, may be regarded as the demand for storage at that time.

The gross return from storing the commodity from one day to the next consists of the increase in the spot price between those two days. Depending on the size of that increase, there will be a certain supply of storage: the larger the increase, the larger the stocks people will be prepared to hold, for the costlier the storage facilities that can be used profitably. The actual

⁴ For a more elaborate discussion of this problem see Samuelson, “Intertemporal Price Equilibrium: A Prologue to the Theory of Speculation” (1), pp. 181–221. I did not see that paper until after the above was written.

⁵ By “carry-over” we always mean stocks carried from one crop year into another, and not stocks held within a single crop year.
day-to-day increase in the spot price, therefore, has to be such as to equate the supply and demand for storage, which means that the increase has to be equal to the marginal carrying cost (the carrying cost in the most expensive storage facility necessary to satisfy the demand for storage).

It is not possible to say a priori whether the marginal carrying cost, and hence the rate of increase of the spot price, will rise or fall during the crop year. On the one hand, storage costs in the narrow sense will decline because stocks shrink all the time and can be housed in ever cheaper facilities, but, on the other hand, the spot price goes up all the time, and the interest charge therefore becomes proportionally heavier. If these two effects happen to offset each other, the rate of increase will be constant; the spot price will increase linearly until the end of the crop year, when it falls to the new crop level (cf. Figure 1). In general, however, the two effects will

\[ \text{PRICE} \]
\[ \text{TIME} \]

**Figure 1**

not offset each other, and the seasonal pattern of the spot price is then more complicated than in Figure 1. It will still be true that the spot price rises during the storage season and drops suddenly when the new crop is available.

Under the above assumptions, consumption per unit of time will fall during the crop year, resuming again as the new production reaches the market (cf. Figure 2). The reason for this is the rise in price when stocks are held, and this effect may be reinforced by a tendency to postpone consumption when a fall in price is due. The extent of the decline in consumption depends on the magnitude of the price rise and on the elasticity of demand. If the latter elasticity is low and the carrying costs small compared with the price itself, as is the case with many raw materials, consumption will hardly decline at all during the crop year. On the other hand,
carrying costs may be so large and the demand elasticity so high (as in
the case of some fruits and vegetables) that consumption drops to zero
soon after harvest, and no stocks are held for part of the crop year.

\[ \text{Figure 2} \]

Despite the numerous simplifications, the above argument is not as
remote from reality as might be thought. To some extent the simplifying
assumptions offset each other, so that the whole is more realistic than its
parts. Let us look into some desirable extensions.

In the first place, not much is changed if we assume that the harvest,
rather than being confined to one instant, is spread out over a certain
period, as is normally the case. (See Figure 3, where the broken line rep-

\[ \text{Figure 3} \]
resents production and the full line consumption.) The price will continue to rise by the marginal carrying cost as long as consumption stays above production, that is, as long as stocks have to be held. At A, production and consumption are equal and the price can start to fall. It does not fall immediately to the new-crop level, however; for, if it did, demand would increase discontinuously and again exceed production. For a while, therefore, the price falls gradually in such a manner as to keep current consumption equal to the newly forthcoming supplies. The extent of the price fall is limited by the demand for storage, that is, by the consumption at the end of the crop year. If the price fell too far early in the season, not enough would be left for subsequent demand, which in the present model is assumed to be known. At B in Figure 3, stocks again are accumulated and the price starts to rise by the marginal carrying cost.

The new seasonal price pattern is shown in Figure 4. There is evidently

![Figure 4](image)

a strong incentive to spread out production in the way shown in Figure 4, for those who sell their crop early or late get a higher price. The reason that most producers nevertheless harvest when the price is lowest is the seasonality in production costs mentioned as the first reason for differences between production and consumption, since in this model the price at harvest must always be equal to production cost.

A second modification that needs to be made has more effect on the price pattern. In practice, production and consumption do not depend only on the price of the commodity considered but also on a host of other factors, which for the moment must still be assumed to be known with certainty. For simplicity we confine our discussion to the most important factor, viz., the weather, and we assume (not altogether unrealistically) that the weather
is the only determinant of the size of the annual crop, but that consumption still depends only on price. We start from Figure 1, since the complications of Figures 3 and 4 can easily be supplied by the interested reader.

Consider then Figure 5. In year 1 the price pattern is determined by

![Figure 5](image)

the size of that year’s crop, so as to make consumption equal to it, and similarly in years 2 and 3. As indicated by the full line, the price at the beginning of year 2 is lower than at the end of year 1, so there will be no incentive to carry over stocks from year 1 to year 2. In year 3, however, the crop is smaller and the price which would equate that year’s consumption to that year’s production is higher than the price at the end of year 2. This means, in effect, that the demand for storage at the beginning of year 2 consists not only of consumption during year 2, but also of the excess of consumption over production in year 3. Prices in year 2 will therefore be raised to the level of the broken line in order to free some of the 2-crop for 3-demand, and the price in year 3 will, accordingly, be lower than if there were no carry-over. If the crop in year 4 is again so much smaller that the price at the beginning of that year (before carry-over) is higher than the price (including carry-over) at the end of year 3, there would be a further demand for storage in year 2, and the broken line would again be moved up.

The carry-over consequently serves to distribute large crops over years with smaller crops in much the same way as seasonal stocks distribute the production from low-cost months to months in which production (if any) is costlier. The extent to which this is possible depends again on the carrying cost, the deterrent effect of which is cumulative. Let $p_{1-o}$ be the price
at the beginning of year 1 if the 1-crop is equal to the 1-demand (not including any carry-over), and $p_{1,0}$ the corresponding price at the end of year 1; similarly for $p_{2,0}$ and $p_{2,0,2}$, etc. We have seen that there will be a carry-over from year 2 to year 3 if $p_{2,0}$ would be higher than $p_{2,0,0}$. If there is a carry-over, $p_{2,0}$ will rise, say, to $p'_{2,0}$, and so will $p_{2,0,0}$ to $p'_{2,0,0}$; $p_{2,0}$ will fall to $p'_{2,0,0}$, which equals $p'_{2,0}$. Now if year 4 is also to get a share of the 2-crop, the pre-carry-over price $p_{4,0}$ has to be higher than $p_{2,0,0}$, which exceeds $p'_{2,0} = p'_{2,0,0}$ by the carrying cost during year 3, while $p'_{2,0,0}$ itself is again higher than $p_{2,0,0}$. The obstacles in the way of year 2’s getting part of the 2-crop are thus more formidable than in the case of year 3.

The carry-over works in only one direction: it distributes large crops over subsequent years, but does nothing to supplement small crops that were not preceded by larger ones. Nevertheless, as has already been mentioned in connection with Figure 2, some relief in small-crop years may come from postponement of consumption when the price is about to decline because the next crop is known to be large. The existence of such a tendency to postponement, which amounts to substitution of later for present consumption, is probable but not necessary. It is also conceivable that the known increase in subsequent supplies may encourage the starting of new consumption processes while current supplies are still short; in that case, present and subsequent consumption are each other’s complement because both are complementary with a third commodity. Whenever the tendency to postpone consumption prevails, negative storage may be said to take place.

III. SOCIAL AND INDIVIDUAL UNCERTAINTY

It is now time to abandon the most drastic of the simplifying assumptions made in Section II, namely that of perfect foresight. In doing so we will also make room for the fourth type of stockholding from Section I.

Suppose first that noneconomic conditions such as the weather are completely foreseeable by everybody, and that every individual knows with certainty what he himself will do under any combination of economic conditions (prices, etc.) that may arise in the future, but that he is not certain about the decisions of other persons under those conditions and has no interest in predicting their decisions. Thus A knows how much wheat he himself will want to buy a year from now if the price is $1.00 per bushel, or $1.10, or any other price, but he does not know how much other people will want to buy or sell, and therefore he does not know either what the actual price will be. Similarly B knows what the weather will be in the coming year, and how much he himself will consequently harvest, but he does not know what price he will obtain. Such a state of affairs is characterized by social uncertainty; it is uncertainty due exclusively to the fact that many individuals take part in production and consumption.

Social uncertainty can be eliminated by forward trading which consists
in buying and selling with delivery at a later date; it should not be confused with futures trading, about which we shall speak in section V. In the above example there would be a market for wheat deliverable one year from now. In this forward market B could offer his crop for whatever it will fetch, and A could cover his needs to the extent that prices warrant. Those who want to hold stocks of wheat for one year could sell them forward in this market, and the difference between the forward price and the current spot price would tell them whether such stockholding is profitable given their carrying cost. The forward price resulting from these various transactions would be equal to the spot price that would prevail in the absence of social uncertainty, and unintentional stocks (the fourth case of Section I) will not emerge. This conclusion only holds, however, when every individual participates in forward trading to the full extent of his foreseeable position. This amounts to assuming that everyone accepts the forward price as a perfect prediction of the spot price. There is no need to consider whether or not the latter assumption is already implied in the assumption of social uncertainty; in any case the two assumptions go naturally together.

The consequences of individual uncertainty are more interesting. Individual uncertainty is present when not all individuals know exactly what they will do under different economic conditions at later times, for instance because they do not know what noneconomic conditions will exist or because they dislike the effort of looking ahead. Individuals may, of course, still have more or less precise ideas as to their later decisions and they may still be willing to anticipate these decisions by buying or selling in the forward market. When they thus anticipate their decision, however, they may find, when the time comes, that a different decision would have been better. Thus the producer B, just mentioned, may have sold forward part or whole of a later crop, but when this crop is harvested he may find that he would have obtained a higher price if he had sold spot at harvest time. The buyer of his crop will have a corresponding advantage.

The possibility of subsequent rejoicing or regret will no doubt affect the extent to and the price at which traders are willing to buy or sell in the forward market. Nevertheless there will be at any time, for every forward price quoted, a definite quantity (possibly zero) which each trader offers or demands. This quantity will in general not be the same as in the absence of individual uncertainty and it will of course depend on many factors besides the forward price. At any time the buying and selling preferences of all traders can be added to form total demand and supply, which the forward price will bring into equilibrium.

In this respect the forward market under individual uncertainty is not different from the forward market under perfect foresight or under social uncertainty. This similarity does not mean, however, that individual uncertainty can be removed by forward trading in the same way that social uncertainty can be. By forward trading an individual can make the out-
come of his activities independent of the course of prices between the present and the date when these activities are completed. As far as he is concerned any difference, favorable or otherwise, between the actual spot price at delivery time and the forward price at which he traded then enters into the category of bygones that are bygones, except to the extent that he may be led to reconsider his forecasting procedures; but for the economy as a whole the matter is not so simple.

Consider the case where a crop turns out to be so small that the spot price at harvest time is much above the previously quoted forward price. Consumers who have bought forward at the low price will have made their plans accordingly, and though some of them may now resell their purchases, others will proceed as if nothing had happened. The new crop will therefore be used partly for purposes which would not have been profitable under the actual spot price. Moreover, the relatively low forward price will have discouraged the holding of a carry-over which would have helped to offset the small crop. Both of these effects, the higher level of demand and the lower level of supply, will act to the detriment of those who have sold forward, and who might have produced or stored more if they had known the actual spot price at harvest time. The result of forward trading therefore has been not that the risks of a small crop have been eliminated, but merely that they have been shifted from forward buyers to forward sellers. Conversely, the risks of a large crop have been shifted from forward sellers to forward buyers.

If the forward market were used only by producers and consumers it would already serve an important function. No matter how much the forward price differs from the ultimate spot price, and how much production and consumption may consequently be distorted from the levels that ultimately turn out to be appropriate, the plans of consumers and producers would at least be coordinated, since total forward supply and total forward demand have been brought into equality by the forward price. It is true that complete coordination can be achieved only if all producers and consumers participate in forward trading, and we shall see below that there are obstacles to such complete participation, but this need not concern us at the moment. Under conditions of individual uncertainty, even complete participation of producers and consumers would be no guarantee that the forward price would agree with the ultimate spot price. There are other traders, however, who might profit from a discrepancy between these two prices without themselves engaging in production and consumption, and who are therefore prepared to enter the forward market. We are referring to speculators.

In a very wide, and therefore unilluminating, sense all decisions that extend over time are speculative, since they imply some degree of confidence that later events will coincide with the expectations behind the decision. A more precise definition of speculation can be given, but this would
lead us too far; for the moment, the every-day notion should be borne in mind.

Anybody, whether inside or outside the trade, who feels sufficiently confident that the ultimate spot price will turn out to be above the currently quoted forward price can expect a profit if he buys forward, takes delivery when it is due, and resells the merchandise thus acquired in the spot market. Conversely, if he thinks the ultimate spot price will be below the current forward price he may sell forward and meet his commitment at delivery time by buying in the spot market. Again, it is not necessary to know the exact shape (if any) of the speculators' "expectations" as to the ultimate spot price. All that matters is how much, for each level of the currently quoted forward price and any other relevant factors, they will want to buy or sell. The actual forward price will be determined by the total demand and supply for forward delivery, irrespective of whether it comes from producers and consumers or from outsiders.

Speculation is not confined to the forward market. If a trader thinks the spot price will rise by more than his carrying cost he may buy spot rather than forward and hold the merchandise as long as he sees fit. In the spot market, however, it is only possible to be "long," that is to be in a position to profit from a rise in price, whereas in the forward market one can also be "short," namely by selling forward without possessing the merchandise sold. In the spot market, moreover, being "long" entails the actual holding of merchandise, but in the forward market longs need only buy contracts for later delivery.

IV. THE HETEROGENEITY OF THE CASH MARKET

We have so far spoken of "the" spot market and "the" forward market. This usage requires qualification, and not merely because there are different commodities such as wheat, corn, etc., each with its own spot and forward market. Even for what is commonly regarded as "one" commodity, the spot and forward market are far from homogeneous. We shall see that this has had a far-reaching effect on the organization of trade.

One important source of heterogeneity is geographical dispersion. The price of wheat in Oregon is not wholly independent of the price of wheat in New York, for if the two prices moved too far apart wheat could be profitably shipped from one state to the other, or suitably located buyers would switch from one source to the other. But these equilibrating tendencies are certainly not strong enough to ensure a very close correlation between the two prices. Supply and demand conditions in the two states may, in fact, be so different that they might be thought to constitute two different markets.

The difficulties of such a view become apparent, however, when we consider that there are several other states between Oregon and New York, each of which we should then regard as a different market. Different
though conditions at the extremes may be, in Illinois and Indiana they can hardly fail to be so alike that one would rather regard these states as forming a single market. But if Illinois and Indiana are one market, would not Illinois and Iowa also be one market, and Iowa and Nebraska? In the absence of any economically meaningful boundaries would not the four states together then form one market? Clearly we could continue this process of joining neighboring states until Oregon and New York are united again. The spot market thus appears as an aggregate of interrelated and not sharply delimited sub-markets.

Much the same holds for the physical, rather than the geographical, heterogeneity of any commodity. Wheat, for instance, is produced in an almost infinite number of varieties and qualities, which for commercial purposes have to some extent been standardized into grades. These grades are more or less adequate substitutes for each other, and their prices therefore tend to move together, but not exactly so. Supply and demand conditions for No. 1 White and No. 4 Hard Winter may be quite different, but the large number of intermediate grades again makes it impossible to draw any meaningful market boundaries.

The spot market, therefore, lacks homogeneity in two respects: location and quality. In the forward market, delivery time is a further source of heterogeneity. Traders may want to contract for delivery at any time from tomorrow until a few years from now, and neighboring deliveries are close substitutes for each other. Indeed, the spot market is nothing but one end of the forward market, and for many purposes it is best to regard them as one, the cash market.

The complicated nature of the cash market, with its many segments all mutually dependent, is not merely a challenge to the economist, who finds his usual tools of analysis too crude to do full justice to it. Its consequences for the traders in the commodity concerned are more serious. Heterogeneity of a market results in a high level of transaction costs, which in turn causes an increase in risk. Transaction costs are the sacrifices necessary to conclude a transaction. The simplest example is a broker’s commission, which is paid for the service of bringing a buyer and seller together. In a market for a homogeneous commodity with a multitude of buyers and sellers hardly any trouble would be involved in making such an encounter possible, but the more specialized the requirements of each trader are, the harder it is to find another trader whose requirements match those of the first trader. To take an example from another area, a person who wants to sell his house may incur much trouble and loss of time until he finds someone who is willing to buy this particular house at a price that is agreeable to both. Until the prospective seller has found a counterpart he runs the risk that the value of his house may change. The situation in the cash market for a commodity is quite similar.

The task of matching producers and consumers is performed by middle-
men, who may be either brokers, merchants, or scalpers. Brokers do not trade for their own account, and their charges therefore represent transaction costs in pure form. Merchants do buy and sell for their own account, and, since they usually perform also such services as grading, storing, and shipping, their income cannot be identified with transactions costs. An important part of their function, however, consists in providing a ready demand for producers and a ready supply for consumers, and to this extent their income consists of transaction costs. Certain traders, known as scalpers, make their living exclusively from short-term price fluctuations, particularly in the futures markets. If, for instance, a large selling order forces down the price, they buy in the hope that buying orders from outside will soon come in to offset the initial price fall, which the scalpers' purchases thus help to keep within bounds. Scalpers' activities do not always have this beneficial effect; indeed they may sometimes aggravate rather than mitigate price fluctuations, but, to the extent that they contribute to a smooth determination of prices, their income is also part of transaction costs.

Transaction costs are not always incurred by those who trade in the commodity concerned. If a group of middlemen operates a commodity exchange its cost will be part of the expenses of the members and therefore included in their charges or other receipts, but if the exchange is operated by a city, for instance, all or part of its cost may be borne by the taxpayers. The latter case will also arise if a government agency provides free marketing information (such as crop forecasts).

We have already remarked in passing that high transaction costs lead to an increase in risk. The reason is that these costs may be so high as to prevent traders from undertaking transactions which reduce their risks. Thus a producer may want to eliminate the risk of price changes on his growing crop by selling forward, but the net return from doing so, after the cost of finding a buyer is allowed for, may be so small that he may decide to bear the risk after all. This in turn makes the cash market less active than it would otherwise be, and thus makes it more difficult to find trading partners, so that the effects of transaction costs and individual uncertainty reinforce each other.

The intervention of middlemen helps to facilitate the use of the cash market by producers, consumers, and speculators, but it does not solve the basic problem of heterogeneity. Indeed, this problem can never vanish completely, for there will always be geographical, physical, and temporal differences between transactions.

To see along what lines an improvement may nevertheless be obtained, it is instructive to consider the introduction of money into a barter economy. In such an economy the producer of wheat would have to find individuals who are willing to exchange his wheat for the clothing, housing, etc., which he needs and which they can supply themselves. His efforts
to find such trading partners would no doubt be considerable, or alternatively he would have to take large risks in waiting until they present themselves. The introduction of money makes it possible for him to avoid a large part of these transaction costs and risks. He can now sell his wheat for an intermediate commodity, money, with which he can then buy the goods he wants, for these goods will be offered for money by their producers. It is consequently no longer necessary for a producer to seek trading partners who produce things he needs; any trading partner who has money is now suitable. This reduction in transaction costs and risks is the fundamental reason for the use of money. It explains why money exists even though it has no usefulness of its own and is merely a general claim on other commodities.

The cash market for a commodity presents all the difficulties of a barter economy in miniature. The introduction of an intermediate good that can serve as a claim on other objects of trading would be equally valuable, even if that good had little or no usefulness itself. To a large extent this need is satisfied by the futures contract.

V. THE FUTURES MARKET

As was true of money, the evolution of the futures contract was largely unplanned, and guided mainly by the slow but sure process of piecemeal adjustment to the needs of trade. Even today different stages of development may be found side by side in different commodity markets. It is not within our scope to trace the history of futures markets; a few words must suffice.

The origins and antecedents of futures trading are partly lost in the mist of Dutch, Scotch, and Midwestern antiquity; judging from the history of many of our commercial institutions, there were probably precursors in Northern Italy, but I have found no references to this effect. It is therefore hard to say when futures contracts similar to the present type were first used. In the cases of Amsterdam and Chicago it seems clear that such devices were initially introduced because of uncertainty as to the nature and availability of shipments that were still “to arrive”; this factor is even today of some importance in a few commodity markets.

In the pre-railroad days in Chicago, for instance, merchants who had bought wheat in outlying territories could not be sure when their purchases would turn up, and what the quality would be. Until arrival they therefore ran a price risk, which in those days of poor communications must have been especially serious. The “to arrive” contracts solved these problems. It was essentially a forward contract in which the time of delivery was not precisely specified and in which the price was fixed on the assumption that the shipment was of some particular grade, adjustments being made when

---

*Cf. Smith (2), Haecou (3), and Working (4) also for further references.*
the grade proved to be different. Merchants who expected to receive wheat were thus enabled to sell it before it arrived.

Gradually the “to arrive” contracts became standardized so as to make them of interest to a greater number of traders and thereby reduce the cost of finding a trading partner. Since the delivery period was somewhat indefinite anyway, it came to be standardized to one month. Some months soon turned out to be more active than others; thus there was particular interest in May because Lake Michigan became navigable during that month.

As regards grades, some standardization also developed. The mere evolution of accepted grades was itself a major advance in commercial technique. Certain grades became particularly important because of their predominance in the territory that supplied Chicago; these grades were therefore generally adopted as fixed points for the determination of grade adjustments. The size of the contract also became standardized in round lots of 5,000 bushels.

Although “to arrive” contracts were originally developed for the use of merchants who contemplated actual purchases and sales, they soon attracted the attention of speculators who were not interested in the commodity itself but only in its price. The standardized nature of the contracts made them superior to ordinary spot and forward transactions as a means of speculation. The intervention of speculators, in turn, increased the volume of trading and further lowered transaction costs, at least in those months (such as May) which were especially interesting to traders, and the larger volume in its turn made for greater publicity, which attracted outsiders.

Because delivery conditions on “to arrive” contracts were so flexible, the identity of the buyers ceased to be important to the sellers, and conversely. The contracts accordingly became less and less personal, and the development of the Clearing House, a general intermediary between buyers and sellers, finally depersonalized them completely. Those who had bought contracts need no longer take delivery if they were not interested in actual merchandise, and they need not even approach the seller to annul the contract; all they had to do was to sell the contract to someone else.

At this stage the original connection with “to arrive” dealings had become very faint indeed: the “to arrive” contract had evolved into the futures contract. This economic evolution had its counterpart in the realm of law. As the contracts became more remote from ordinary transactions in the cash markets, it became more dubious whether they were not mere gambling deals and legally unenforceable as such. The large-scale utilization by speculators made this question all the more acute. The courts established the rule that futures contracts were binding only when actual delivery was contemplated. A clause to this effect appears to this day on brokers’ statements.
Since traders can avoid delivery by buying or selling the contract before delivery is due, the presumption of intent to make or take delivery is largely a legal fiction. It nevertheless has a vitally important bearing on the relation between the futures price at delivery time and the spot prices at that time. Apart from certain technical complications the futures price upon the expiration of the contract has to be equal to the spot price of at least one deliverable grade. This ultimate equality influences the decisions of at least some buyers and sellers of the contract throughout the life of the future (i.e., the time during which it is traded). Although buyers, for instance, can avoid delivery by selling before expiry, and usually do so, they may "stand on delivery," and so may some sellers.

The possibility of delivery makes futures contracts analogous to banknotes under a convertible currency. If there is only one deliverable grade, this fulfills the place of gold under the gold standard; when there are several deliverable grades, the situation is analogous to a multiple standard such as existed in many countries before the silver standard and, afterwards, the gold standard were established. The peculiarities of a multiple standard first led to the formulation of Gresham's law; and, in fact, the substitution between deliverable grades is nothing but an instance of Gresham's law.\textsuperscript{7}

Although the possibility of delivery helped to maintain a relation between spot prices and futures prices it also led to abuses. Short sellers got into difficulties when they were unable to buy in their contracts before expiration or to obtain actual merchandise with which to meet their obligations. When deliverable stocks were small, large traders could exploit the plight of the shorts by operating "corners" or "squeezes," which are attempts to monopolize the long side.\textsuperscript{8} The exchanges themselves, who regulated and administered futures trading, were not always diligent in preventing such excesses, for the beneficiaries from corners and squeezes were often their own members, and the victims were usually outsiders. Laws were revived or enacted which made manipulation of the futures market a criminal offense, but until the establishment of government agencies with adequate powers of supervision and investigation, it was often hard to prove manipulation.

The danger of corners and squeezes kept many potential traders from using the futures markets for speculation and hedging. The most effective weapon against this danger is extension of deliverability. The larger the variety of grades that can be tendered on futures contracts, the smaller the possibility that the deliverable stocks will be controlled by a corner. Deliverability of a grade, however, is not enough to make delivery feasible,

\textsuperscript{7} This analogy was suggested by Professor Holbrook Working.

\textsuperscript{8} In a "corner" such an attempt extends beyond the futures market into the spot market; a "squeeze" is confined to the futures market but may occasionally also be attempted from the short side.
for the premiums and discounts for nonstandard grades may be such as to restrict effective deliverability to one grade, in accordance with Gresham's Law. Moreover, deliverability depends not only on the grade but also on the location of the stocks involved.

Thus before 1930 the New York cotton contract called for delivery in New York. In the nineteenth century, when cotton was grown in the southeast, manufactured in New England, and exported through Atlantic ports, New York was a natural location for delivery, since stocks had to be held there in any case. As cotton growing moved westward and cotton manufacturing southward, however, New York came to lie outside the normal channels of the cotton trade, and ordinarily stocks would be held in the south. Manipulation of New York futures became easier and made their use by the trade increasingly inadvisable. After much official pressure the contract was finally changed so as to make delivery in southern ports acceptable and in practice obligatory. This restored the usefulness of the New York contract, which also allows for effective deliverability of a wide range of grades and staples of cotton. It is no doubt due largely to the flexible provisions of the contract that futures trading occupies such a vital place in the marketing of cotton.⁹

Effective deliverability of a broad range of grades and locations is desirable not only because it makes manipulation more difficult; it also widens the range of spot prices with which the futures price is correlated through the delivery mechanism, and this is particularly important for hedgers. On the other hand, it makes futures contracts increasingly unsuited to the acquisition or disposition of actual merchandise, and makes them more and more akin to money.

VI. FUTURES CONTRACTS AND HEDGING

Illuminating though the comparison of futures contracts with money is, it should not be pushed too far. The careful reader will already have been put on his guard by the fact that in the preceding discussion different types of money were used as objects of comparison at different points. As we shall now see, futures are in fact more akin to bonds than to ordinary currency.

The principal differences between futures and currency are (1) futures contracts are dated, rather than payable on demand as currency technically is, and (2) their use is confined to one "commodity" (albeit a heterogeneous one) rather than to all commodities. The latter factor explains why, for example, "wheat money" (that is, contracts exchangeable at sight into any kind of wheat) cannot survive when "general money" (coins, bills, checks, etc.) is also in existence: the general money, being of wider usefulness, would make the special money redundant, and the additional trans-

⁹ Cf. Garside (5) for an excellent discussion.
action costs due to having more than one variety of money would make its use undesirable.

This redundancy, however, does not pertain to dated bonds. There is scope for "wheat bonds," "cotton bonds," etc., in addition to "money bonds," if the latter term may, for a moment, denote the bonds payable in ordinary currency on a specified date, with which we are all familiar. These "commodity bonds," in fact, are nothing but the futures contracts discussed in Section V, and they are useful because they facilitate the holding of inventories, just as "money bonds" facilitate other capital transactions. To see why this is so it is necessary to go briefly into the subject of hedging; a final answer to the problem will be given in Section VII.

A trader is said to be a hedger if his commitments in the cash market (that is, his spot and forward commitments) are exactly offset by commitments of opposite sign in the futures market. To take the simplest case, if a merchant has 1000 bales of various kinds of cotton on hand, and if he is at the same time short 1000 bales of cotton futures, his cotton inventory is said to be hedged. More particularly he is a "short hedger," the adjective indicating the sign of his futures position. He would also be a short hedger if he had bought 1000 bales of specified quality and location forward (that is, for delivery at a later date) and had again sold 1000 bales in futures contracts. "Long hedging" arises, for instance, in the case of a miller who

10 In his paper "Le Rôle des Valeurs Boursières dans la Répartition la Meilleure des Risques" (6), Kenneth J. Arrow has shown that under certain conditions (including social and individual uncertainty) the existence of only one type of security, payable in money, will suffice for the coordinated adaptation of every individual’s commitments to the risks he deems to be present. Forward trading, as described in Section III above, would consequently be unnecessary, and so would "commodity bonds" in the sense defined in the text. While granting the logical validity of this remarkable result, I am nevertheless inclined to question its empirical relevance, even under the assumptions made by Arrow. The securities he describes are rather like very complicated sweepstake tickets, whose payoff depends on which of many alternative "states of nature" is realized. The notion of a "state of nature" unfortunately raises more difficulties than it solves. Consider, for instance, the case of a farmer who wants to arrange his commitments in accordance with his subjective probabilities concerning the price and size of his growing crop. There is an almost infinite variety of states of nature which he would have to take into account, and whose effect on the price and size of his crop he would have to know. Arrow would then want the farmer to buy or sell a ticket, or combination of tickets, whose price and payoff would yield a maximum of expected utility given his subjective probabilities. Clearly it would be much simpler if the farmer just sold his crop forward; this would, among other advantages, dispense him from the construction of theories about the way in which crop sizes and prices are determined, a task with which even specialists have not made much progress. It is, incidentally, also somewhat misleading to say, as Arrow does, that by means of the securities he describes the number of markets can be reduced. Since the securities themselves would be highly heterogeneous (because of their reference to different states of nature) they can hardly be regarded as constituting a single market.
has undertaken to deliver the flour equivalent of 100,000 bushels of wheat without actually having the wheat in stock (or without having bought it forward) and who at the same time has a long position of 100,000 bushels of wheat futures; it is closely related to "negative storage" (cf. Section II above).

Apart from the long and short hedgers, only one other group of participants in futures trading has to be considered here; viz., the long and short futures-speculators, defined to be those traders whose futures commitments are not offset by cash commitments (if any). A third group of participants, consisting of the "futures-spreaders" who are short in some futures contracts and long in an equal amount in other contracts, has net futures commitments equal to zero, and can be disregarded for the present purpose.

Since in a futures market the total short and the total long position must be equal, any excess of short over long hedging must be matched by an equal excess of long futures speculation over short futures speculation. This equality holds for every securities market, though it is sometimes disguised by institutional conditions; thus corporations, who constitute virtually the entire short side in the market for shares—the so-called "shorts" account for only a minute fraction of the total number of shares outstanding—rarely trade in their own issues. The equality also holds for forward markets in commodities or foreign exchange. It does not hold, however, for the spot market, in which it is impossible to be short.

Now it can be shown\(^{11}\) that most of the time futures position of short hedgers exceeds the futures position of long hedgers. The demonstration falls outside the plan of the present article; ultimately it is based on the just-mentioned asymmetry of the spot market. Though an excess of long hedging over short hedging is by no means impossible, I shall simplify the argument by assuming, from now on, that the normal relation between short and long hedging prevails. In fact it will be convenient to consider only two groups of traders: the short hedgers (excluding those whose positions are offset by long hedgers) and the long futures-speculators (excluding those whose positions are offset by short futures-speculators). The market thus defined is evidently a highly idealized one, whose long side consists only of speculators and whose short side only of hedgers. It is not difficult to bring in the groups of traders who have been "netted out," but I shall not attempt to do so here.

After these preliminaries we can return to our current concern, the theory of hedging. Why does a trader hedge? The customary answer is:

11 This is one of the elements of Keynes' theory of "normal backwardation" upon which much of the following argument is based. A full discussion and reformulation of this theory will be given elsewhere. Some relevant empirical material may be found in Houthakker, "Can Speculators Forecast Prices?" (7), pp. 143-51.
to reduce the risk of having a position in the cash market. If carefully interpreted, this answer is not incorrect, but stated without qualification it is highly misleading. Its defect is the suggestion that the cash position is primary, and the offsetting futures position no more than an afterthought. In an important paper (8) Professor Holbrook Working has emphasized, on the contrary, that traders will normally consider cash and futures transactions in coordination and that the decision to engage in the one kind cannot be independent of the decision to engage in the other. According to Working, the decision to hedge is normally made in anticipation of a favorable change in the spot-futures price-spread, just as a decision to buy spot (without hedging) is motivated by an expected favorable change in the spot price. That this must be so is clear from the fact that the profit or loss on a hedging transaction equals the change over time in the “basis” (as the spread between spot and futures prices is often known) multiplied by the size of the commitment.

By a similar line of reasoning, it is possible to analyze the choice among three alternatives: hedging, long cash speculation (that is, the holding of an unhedged long position in the cash market), and long futures speculation. After the elimination of long hedging and short futures speculation, these are the principal alternatives to be considered. Clearly, the choice among them depends on the total profit obtainable, given the resources with which the trader operates.

These resources are mainly of two kinds: the trader’s skill in different types of transaction, and his financial position. The skill consists basically in a knowledge of the special factors, economic, technical, institutional, and personal, that are relevant to the formation of prices. In the cash market the heterogeneity already discussed in Section IV provides ample scope for the exercise of merchandising skill. At the same time this skill is not likely to be found among occasional traders: those who have acquired it, usually after a long apprenticeship or similar experience, will normally find it worth their while to specialize in this line of business. Another important aspect of this merchandising skill will be mentioned in a moment (p. 154).

The type of skill appropriate to the futures market is rather different. Indeed, according to the theory of normal backwardation, no more skill is necessary to make a long-run profit than a determination to stick to the long side. This simple policy enables futures speculators, at least over a sufficiently long period of time, to receive the risk premium which, as we shall see, the short hedgers are willing to pay. There is some evidence that the bulk of speculators’ profits is, in fact, derived from this source.12 Apart from this “general skill,” consisting only in being long, there is scope for

12 Cf. Houthakker (7).
"special skill" which requires an ability to forecast price movements other than the persistent upward tendency of futures prices predicted by the theory of normal backwardation. Such skill appears to be much rarer, and its possessors are likely to be skillful in the cash market as well, because of the overlap in the factors determining prices in the cash and futures markets.

All of these skills can be measured in various ways. The most convenient one for the present summary account is as an annual percentage return on the average value of the physical units (bales, bushels) held in a given line of business by a given trader. Thus, a merchant may be able to make 25 per cent per year on the average value of his stock (which may, of course, turn over several times per year). According to some unpublished calculations relating to corn and cotton futures, the risk premium accruing to long futures-speculators with "general skill" before deducting commissions and other expenses, is of the order of 8 per cent per year on the value of their holdings; Keynes himself, on the basis of unspecified data, had put it at 10 per cent (9, 10).

By measuring skill in this fashion, an implicit assumption is made, namely that the percentage return is independent of the number of physical units to which it applies. Accordingly, there would be no diminishing returns to the exercise of skill. As far as general skill in futures speculation is concerned, this is probably realistic. In the case of commercial skill, the assumption is more debatable and a full analysis would require a subtler argument.

Leaving aside this point, we next observe that, for a trader with limited capital, skill is not the ultimate determinant of profit. The decisive criterion is average return per dollar of owned capital, which can be computed by multiplying skill, as measured above, by the value of holdings which one dollar of investment will support. An example may make this clearer. If the margin required for futures-speculation is 10 per cent of the value of the contract (a not unrealistic figure), plus another 10 per cent which the prudent trader would hold as a cash reserve, then the return per dollar of owned capital is 40 per cent per year if the futures price increases by 8 per cent per year on the average.

In the case of merchandising in the cash market, capital requirements depend on whether inventories are hedged or not. If a well-organized futures market exists, bankers are willing to finance a considerably greater part of the value of hedged than of unhedged inventories. For example, they may advance 90 per cent of the value if hedged, as against 70 per cent if not hedged. Consequently, the merchant has to provide three times as

---

33 Or, perhaps, ability to bring about price movements through manipulation. As a result of government supervision and regulation the possibilities of manipulation have fortunately been much reduced.
much of his own capital if he does not hedge. It is probably typical of the commercial sector that equity capital (as distinct from loans secured by collateral) is hard to obtain; one item of evidence is that commercial enterprises (apart from department stores) are virtually unrepresented on the New York Stock Exchange. Hence, for the merchant with limited capital, hedging permits a larger scale of operation and, consequently, a better utilization of merchandising skill.

Now it must be granted that the assumptions made (constant percentage return to the value of inventories combined with limited capital) tend to overstate the advantage of hedging. If the return to skill increases less than proportionately to the value of inventories, or if capital is not rigidly rationed but available at an increasing rate of interest, then the advantage of hedging will be smaller than suggested above, but the conclusion will be weakened merely quantitatively and not qualitatively. Leaving these refinements to another occasion, it may be asserted with confidence that hedging is not, or at least not directly, a means of avoiding risk, in accordance with the *adagium* "nothing ventured, nothing gained." Hedging may reduce the risk *per unit* of inventory, but in general it will not reduce the *total* risk.

We must next briefly consider in what way hedging reduces the risk *per unit* of inventory, where risk will be taken to be identical with variance of return.\(^\text{14}\) Hedging, it will be remembered, involves taking commitments of equal size but opposite sign in the cash market and in the futures market. The mere fact that these commitments have opposite signs does not imply a reduction in risk; thus a trader who is long one million pounds of spot coffee and short one million pounds of lead futures is not likely to have reduced his risk per pound of coffee and, for practical purposes, is not hedging. In this example it is evidently debatable whether his long and short commitments are of the same size, since coffee and lead are commonly thought of as different commodities. The issue is not one of semantics, however. As we have seen earlier in this paper, it is often hard to define what constitutes *one* commodity, and rather than philosophize on that elusive question we should recognize from the start that there is an almost infinite variety of objects of trading, distinguished by quality, location, and time, which cannot without arbitrariness be grouped into meaningful, single commodities. A merchant, for instance, who has an inventory of one million bushels of Soft White wheat in a Seattle elevator, and is short one million bushels of Kansas City wheat futures, cannot be said to be hedging *merely* because the word "wheat" occurs in the description of both sides of his balance sheet.

It can be shown that the factor deciding whether or not variance per

\(^{14}\) This identification, though reinforced by precedent, really begs a great many questions which cannot be discussed in the present context.
unit is reduced is the correlation between the prices of the items on the two sides of a trader’s position. More particularly, short selling to offset a long position completely will reduce the variance per unit of the long position if the regression coefficient of the spot price on the futures price is positive and exceeds one-half. The trader just mentioned who was long coffee and short lead futures probably was not hedging because the regression coefficient of the spot price of any kind of coffee on the futures price of lead is no doubt small, especially in the short run. Whether the Seattle wheat merchant of the second example was reducing his unit variance is a matter for empirical investigation, and not one of terminology.

Reduction in the unit variance, it should be added, is only a necessary and not a sufficient condition for the profitability of hedging. Other relevant factors are the availability of credit on hedged and unhedged inventories (though the willingness of bankers to advance different percentages is itself a reflection of the unit variance) and the cost of the hedging operation itself. The latter consists of two parts: the transaction costs of futures trading and—probably more important—the risk premium paid to speculators, which, as we saw earlier, is necessary to keep them in business in the long run. It is conceivable that during certain periods, such as the 1920’s or the years just after World War II, mere love of gambling will provide sufficient incentive to speculation, but in the long run something more tangible is needed. The risk premium is paid by short hedgers because it is manifested in a tendency for the price of a futures contract to rise from the inception of trading to maturity, thus causing losses to those who are short. A high risk premium will therefore discourage hedging.

VII. THE FEASIBILITY OF FUTURES TRADING

It is now time to collect the trains of thought pursued in the last three or four sections, and to return to the question raised in the introduction: when is futures trading feasible? We have seen that futures contracts serve the needs of speculators who are not interested in the minutiae of the cash market, and who want to confine themselves to the forecasting of price trends that are common to all or most of the varieties of a “commodity.” We have also seen that futures contracts are useful to merchants, who can make a better return on their capital if they sell futures as a hedge, and are thus enabled to concentrate on the minutiae. In fact the speculators thus help finance the merchants’ inventories, even though they do not give direct loans to the merchants or to anybody else: by buying futures contracts from the hedgers they enable the latter to obtain credit on more favorable terms. For this service, according to the theory of normal backwardation, the speculators earn a risk-premium in the long run.

Viewed in this light, futures trading would seem to be one of those
marvels that ought to be invented if they did not already exist. Yet the number of futures markets is surprisingly small: in the whole world there are probably not more than 60 or 70 (not counting those that are dormant), and not more than 40 or 50 commodities are traded on them, some commodities being traded on two or more markets. Some of those markets, particularly in grains and cotton, are of central importance in their respective industries, but many others appear to have only a tenuous existence of no more than marginal interest for the marketing process. Nor is the nature of the commodity a very informative guide as to the existence of futures trading: it exists in coffee and cocoa, but not in tea; in copper and other nonferrous metals, but not in pig-iron; in many grains including rye, but not (in the United States) in barley, which is a far more important crop than rye; in cane sugar, but not in beet sugar or salt; in eggs, but not (in recent years) in butter.

It would carry us too far to consider for each of those commodities why there is futures trading, or why there is not. Instead, we may sum up the discussion by looking at the criteria determining the feasibility of futures trading. These criteria are two in number: (a) The correlation between the spot prices of a large number of varieties on the one hand, and the futures prices on the other hand, should be large enough to make hedging worth while despite the risk premium accruing to speculators. (b) The volume of trading in futures contracts should be large enough to make transaction costs distinctly smaller than in the cash market.

The crux of the matter is that these two criteria are opposed to each other. Thus a high correlation between the various spot prices and the futures price could be achieved by defining the contract in a very narrow manner, so that only one or two grades, at one or two locations, are deliverable (for instance only No. 2 Soft White Wheat in Seattle). If that were done the volume of trading would be so small that transaction costs would be the same as, if not higher than, in the cash market. To engage in this kind of futures trading as much commercial skill would be necessary as is required of cash merchants; outside speculators would therefore hardly be attracted. In fact the hypothetical futures contract just described would be almost indistinguishable from a forward contract. Other disadvantages of narrowly defined futures contracts have been discussed in Section V.

When futures contracts have a large range of deliverable grades, on the other hand, there is a danger that they may not be useful to large numbers of potential hedgers because the futures price is no longer sufficiently cor-

---

15 Actually the example is not entirely hypothetical. There are facilities for wheat futures trading in Seattle, but they are rarely used. A few years ago the Chicago Board of Trade introduced a special contract for North Pacific Coast wheat in addition to its regular, broadly-based wheat contract; trading was negligible, however, and the experiment was soon abandoned.
related with the particular spot prices in which they are interested.\textsuperscript{16} The extent of this danger depends on two factors: the technical nature of the futures contract—more particularly, the price adjustments which they provide in the case of delivery of nonstandard grades—and the existence of a well-developed grading system. The more perfect the grading system, the better the correlation between spot and futures prices is likely to be because of the resulting reduction in transaction costs in the cash market. The highest perfection appears to have been reached in cotton, where transactions are often made on description only, without actual sampling of the lots involved. In the case of tea, on the contrary, there apparently is no generally accepted grading system at all, so that futures trading is impossible.

Even if a contract suitable for both hedgers and speculators could be devised, it is by no means certain that interest in futures trading is large enough to keep transaction costs low. The mainspring of futures trading, according to the view presented here, is the need to finance inventories in the face of fluctuating prices. A prerequisite for sustained trading, therefore, is the existence of considerable inventories. This is the reason agricultural commodities are so prominent: the seasonality of production means that after harvest enormous stocks have to be held, whereas in manufacturing, inventories are relatively much smaller. In manufacturing, including wholesaling, inventories appear to be rarely equivalent to more than one or two months' consumption; in agriculture they sometimes exceed one year's consumption.\textsuperscript{17} Furthermore, the variance of prices differs greatly between commodities. The price of copper appears to be more variable than the price of steel; moreover the latter price is more closely controlled by the firms that hold much of the stocks, thus reducing the need for hedging. In recent years the Government has done much to stabilize the prices of agricultural commodities and has also undertaken to hold large inventories, but the hedging needs of private merchants are still very large.

Such are the limitations which have prevented futures trading from spreading beyond a rather small number of commodities. Occasionally, active markets survive for some time in the absence of large-scale hedging, just as Monte Carlo and Las Vegas survive by catering to the gambling instinct. In general, however, futures trading can be understood only as a response to the trading problems of a heterogeneous cash market with social and individual uncertainty, where specialization is necessary to keep the cost of making transactions and of holding inventories to a minimum.

\textsuperscript{16} This is also the reason—to return to a question raised at the beginning of Section VI—why "money bonds" cannot do the job of "wheat bonds," "cotton bonds," etc.

\textsuperscript{17} This point was emphasized by Keynes (9).
References


