The Role of Cash Settlement in Futures Contract Specification

Allen B. Paul

Introduction

Background. Cash settlement is a device used instead of physical deliveries to fulfill futures contract obligations upon contract maturity. In 1981, cash settlement was first applied to trading futures contracts in Eurodollar time deposits and to three different stock indexes. Since then the method has been adapted to trading in seven more items on U.S. exchanges. Interestingly, some of these are physical rather than financial.

Moreover, many proposals embodying cash settlements are pending before the Commodity Futures Trading Commission (CFTC) and more are in prospect. Mostly they reflect a wish to get around intractable problems of delivery for items that are not now traded on futures exchanges but that can be well standardized and accurately described. These items cover a very broad field. Also they reflect a wish to convert some existing futures contracts that have chronic delivery problems to cash settlements.

As a result of all this activity, several questions having policy connotations arise. What economic purpose would be served by cash settlements? What might be the price effects? As compared with standard delivery contracts, would the basis risk facing hedgers be increased or decreased? Would there be a greater danger of manipulation? How might undesirable influences be controlled? What role should government play in restraining or promoting the use of cash settlements?

In resolving such issues one needs to gain sufficient insight into the workings of the system to make reasonably good predictions of what a particular policy choice would accomplish. This task is not easy. Like most institutions of trade in a well-developed market economy, futures trading involves fairly complex economic processes.
The main purpose of this essay is to provide a fuller understanding of what cash settlements are or can be and how they can function in widely different settings. To the extent the essay fulfills this purpose, it should help generate informed opinion about desirable public policy on the use of cash settlements in futures contracts. Some conjectures and preliminary judgments are offered when they are indicated by available evidence.

**What Is a Cash Settlement?** Under a cash settlement, the seller, who has not offset his or her contract by the end of trading, in effect gives the buyer a sum of money equal to the current economic value of the item less a sum the buyer originally had agreed to pay. Therefore, only the difference need be paid by the seller to the buyer, or by the buyer to the seller, according to whether the price rose or fell during the contract interval. In practice, periodic additions to or subtractions from each party’s margin account are made during the life of the contract, according to the daily changes in the settlement prices. Thus the final adjustment is the final “marking to the market” of the contract’s value at the end of the last day—based, however, on a reading of cash prices for immediate delivery or of some type of index. Clearly the final futures price should not be determined on the basis of itself; to do so would permit the settlement to become quite artificial.

The final value of the futures contract is determined by a formula to which both parties subscribe on entering the contract. The formula requires objective numbers or informed estimates of what these numbers are. For cash settlement contracts to work, traders of futures contracts must have confidence that the settlement is a reasonably accurate reflection of current commercial values.

**The Evolutionary Aspects of Cash Settlements.** Changes in the institutions of trade usually have their antecedents. Cash settlements are the latest in a long chain of historical developments that have made futures trading a “paper market.” As applied to physical commodities such as grain, the developments include improvement of grading standards; better regulation of the issuance, transfer, and extinction of warehouse receipts; circulation in the pit of delivery notices in place of warehouse receipts; the provision for substitute delivery; the use of the voluntary “ring settlement”; the creation of the exchange clearinghouse to replace voluntary ring settlement and its later evolution as the main guarantor of futures contracts; and many other things that have eased the process of liquidating futures contracts by offset rather than by physical delivery.
In sum, the evolutionary process permits the more serviceable trading arrangements to survive and the others to fall by the wayside. Yet the process of trial and error usually is a slow one, and the most suitable trading arrangements may not emerge quickly. The current experiments with cash settlements seem to be changing the pace of evolution. Moreover, though cash settlements are evolutionary in character, they seem to have reached a point where some appear to be having revolutionary consequences.

**Potential Applications of Cash Settlement Contracts.** Commodities that are perishable, take special handling, or are geographically dispersed make physical delivery on futures relatively costly. For these, cash settlements may appear to be an attractive idea. The cash price indexes have their own problems, however. In practice, the indexes may be constructed from price quotations representing somewhat different grades, locations, or timing of transactions; or they could merely reflect different perceptions of price. In any case, for a futures contract to become actively traded over a substantial period of time, the changes in the index number must correlate fairly closely with changes in the individual prices facing a substantial number of hedgers; also, the index number must not be easily manipulated. These matters require separate case studies.

For financial instruments, physical delivery may entail various difficulties. There may be legal barriers to assigning a debt claim to a third party.\(^2\) The quality of debt issues deliverable on a futures contract may vary. If discounts are given for less desirable issues, these could turn out to be inadequate. If an index is traded on futures, the sellers may incur large costs if they were required to deliver certificates. Each of these difficulties could be bypassed if good price quotations with which to compute cash settlements were available for the items.

The potential for trading index number futures, whether for financial items or for physical items, seems large. An index can summarize in one number a large field of economic information of interest to some group.\(^3\) For example, futures trading in the Consumer Price Index (CPI), approved in April 1985, began trading in June 1985. Trading an index of ocean freight rates on two foreign exchanges began in May 1985.\(^4\) Plans are being made to trade price indexes in foreign currencies.\(^5\)

More surprisingly, several proposals to trade in quantity indexes have been made. For example, proposals now before the CFTC are to trade in indexes of manufacturers' earnings, new car sales, and housing starts. The latter two are indicators of current demand and
supply conditions for each industry. Futures markets in such indexes would be a means to express differing opinions on the prospective levels of these forces. Traders whose opinions turn out wrong would pay traders whose opinions turn out right. Assuming that such markets became active, the manufacturers and merchandisers of materials for making autos or houses, who must carry substantial inventories, would have a way of curtailing their exposure to loss from an unexpected downturn in demand.

If futures markets in such indicator contracts were to develop, the question of futures trading legitimacy might surface once more. The trading activity would appear as pure wagering. Yet wagering has its legitimate business uses. There is a need to spread particular hazards of business enterprise among economic interests that have diverse asset positions. Otherwise the risks must be borne by the business itself. A common means that firms use to reduce risks is the purchase of insurance—itself a form of wagering. Insurance is not commonly offered for some important business risks, like a downturn in demand, however. Insurance works only when the risks or outcomes of different policyholders are uncorrelated. This is not true for market phenomena.

The main requirement to settle the contracts in quantity indexes is a consistently and objectively reported numerical series that is widely accepted as relevant and is available equally to all traders. Clearly the numbers must be free from tampering.

**The Policy Issues.** Cash settlements raise issues concerning three interrelated matters: the behavior of prices, the effectiveness of hedging, and the potential for manipulation.

Proper behavior of prices means that prices do not depart from levels warranted by supply and demand conditions. Price inaccuracies could have several causes. One is ineffective arbitrage. Under each futures liquidation method, several forms of arbitrage could occur. One form that is possible under physical delivery is lost under cash settlement, however—namely, purchasing a commodity in the cash market, selling it in the futures market, and then delivering it on the futures contract. Arbitrage under a cash settlement system would involve juxtaposition of buying and selling operations in cash and futures markets but taking or making delivery only in the cash market. Hence, for cash settlements to improve pricing accuracy would require that the cost of delivery on the futures market would exceed such costs in the cash market.

Another aspect of pricing accuracy regards the stability of prices. Under cash settlement, arbitrage operations between cash and futures
markets might get so large as to destabilize cash prices for some time. Concerns over this matter in the markets for corporate stocks have recently been voiced both with and without manipulative overtones.7

A related issue concerns the possibility that a successful cash settlement scheme could undermine the use of the cash market on which the continued success of the cash settlement scheme depends. This would be another manifestation of formula pricing, which has been of such great concern in markets for certain agricultural products.

The issue of hedging effectiveness relates to how well the futures prices would represent prices that potential hedgers pay or receive in cash markets. But representativeness also is required of the commodity specified in traditional futures contracts if they are to have business uses. Hence, the problem in each commodity situation boils down to evaluating what sort of terms can be arranged under each method of contract liquidation.

In situations in which physical delivery contracts would be impractical (as for broad indexes), comparisons obviously cannot be made between cash settlements contracts and physical delivery contracts. The issue becomes confined to allowing or not allowing such contracts to be traded on futures markets.

Perhaps the greatest concern with cash settlement contracts has to do with manipulation. To show what is involved, I will abstract for the moment from geographical dimensions of the market and transaction costs. It is not obvious that one type of settlement permits any more manipulation than the other. Under a conventional contract, the typical long manipulator would force some deliveries to raise prices in the cash market, thus inducing other shorts to offset their futures contracts at nearly as high prices. The manipulator's net gain would be equal to the gain in the futures market minus the loss in the cash market from later reselling what has been received on futures delivery. Under a cash settlement contract, the manipulative gain also would be due to the gain in the futures market (from getting cash settlements at artificially inflated prices) minus the loss in the cash market from later reselling what the manipulator had purchased in the cash market to bolster prices. The same amount of capital would raise prices by a given amount in each case. The only difference would be which of the parties to the futures contract had made the purchases in the cash market.

Once the geographical dimension of the market and transaction costs are admitted, however, other outcomes are possible. The short-run supply curve for spot delivery of a commodity at one location
has greater positive slope than the aggregate supply curve for the spot commodity across several locations. This means that would-be manipulators need more capital to drive up cash prices by a given amount across several locations, during the reading period for determining cash settlement, than they need to drive up the price by a like amount at only the par location in a conventional contract.

Designers of conventional contracts often try to deal with this matter by adding delivery points; but setting accurate differentials is difficult. Each added delivery point increases uncertainty for the longs and imposes added costs of taking delivery. If there is more than one delivery point, the long hedger who takes delivery must generally bear the costs of selling the commodity received on delivery and buying a like quantity where it is wanted. The costs of selling out-of-location deliveries are avoided by cash settlement. This solution, however, requires a substantial body of good cash market prices with which to determine cash market values.

In financial markets, the problem of adding delivery points does not arise. In general, the prevailing opinion has been that the cash markets for some securities are so large and deep that manipulation of cash prices would be virtually impossible. Yet recent aberrations of stock market prices at the expiration of option and futures contracts have brought this dictum into question.

Plan of Study. Because cash settlement can cover widely different arrangements, this essay first explores the full range of possibilities in terms of a classification scheme that is based on historical and contemporary materials. This exploration is followed by an analysis of important theoretical issues in gauging price behavior under cash settlements. Then I treat cash settlement of futures contracts for financial instruments separately from cash settlement of futures contracts for physical commodities. This separation is made to show essential differences between the two categories.

Next I outline a little-discussed topic—the provision of a choice of settlement methods—revealing the high degree of sophistication that can be built into cash settlement techniques. This topic is followed by a discussion of the special problems that would arise if futures trading in quantity indexes (so-called economic indicator contracts) were to develop. Finally, I examine the main public policy issues for which the study has laid groundwork.

Types of Cash Settlements and Their Uses

The known uses of cash settlements before 1981 are very few. In the United States the Chicago Board of Trade (CBT) in 1968 launched
an iced broiler contract to which in 1972 it added a cash settlement feature. Iced broilers are the most perishable of all commodities traded on the exchanges. A languishing interest in broiler trading before 1972 led to the view that buyers were disadvantaged when forced to take and dispose of the commodity. Hence they were given a cash settlement option.

They could either accept delivery (which was in the form of a shipping certificate issued by a processor, constituting a call on its production) or sell the certificate back to the processor within twenty-four hours at the current cash market price—taken as the average cash price for such broilers delivered into Chicago the following week, as reported by the U.S. Department of Agriculture (USDA).

Following this contract revision, the open interest more than doubled in the next four years compared with the previous four years. Afterward, however, futures trading in broilers declined and then disappeared. It is unclear whether the demise was associated with the way in which cash settlements worked, although some questions on this score were raised at the time.\(^\text{11}\)

In any case, providing for an optional cash settlement has interesting potential. All futures contracts in the United States that now call for cash settlement do not permit delivery. Yet, considering the entire array of futures trading possibilities, providing for a cash settlement option to buyer or seller or to both might be best in some situations.

Another case, which occurred in Japan, teaches a different lesson. Trading in Osaka rice futures contracts arose in the last half of the seventeenth century, calling for mandatory cash settlements. By 1730, the market was officially recognized by the Tokugawa Shogunate. Exchange rules specified that trading would take place in standardized contracts with four months to maturity. A majority vote of the traders determined the par grade of rice but physical delivery was not permitted. All differences in value were settled in cash.\(^\text{12}\) How these cash payments were determined is unclear.

One Japanese writer noted simply that the rice exchange "further developed within the short span of four to five decades the systematic method of trading by fairly sophisticated application of cash settlement; the system which permits transaction of commodity only by means of monetary settlement of accounts as against goods deliveries and transfers."\(^\text{13}\) He observed further that "this pattern of evolution in the history of commodity trade is quite unique to Japan, and probably unprecedented in other countries at least in such an early stage of its development."\(^\text{14}\)

According to Henry H. Bakken, rice prices became unstable toward the end of the Tokugawa era. Prices in the spot market bore
little relation to prices in the futures market. In 1863, the four-month deferred contract was curtailed to two months and, in 1869, to one month. Shortly thereafter, the futures markets were closed by the Meiji regime. In a few years, however, the Osaka exchange and other exchanges were reopened under rules that required physical delivery and not cash settlement. Bakken observed that this step “effectively tied the cash markets to the futures markets for the first time in Japanese trading.”

If this statement is correct, it is hard to see how futures trading with cash settlement could have been useful for business purposes. The cash market and the futures market in rice must be tied closely together if the latter is to provide an effective means for hedging.

A Typology of Cash Settlements. The two historical cases sketched above, plus several recent proposals to promote futures trading in quantity indexes, suggest a way to sort out the various possible cash settlement schemes. Thus one basis of classification is whether the numbers used in arriving at cash settlements are prices or quantities; another is whether traders are allowed to choose between cash settlement and physical delivery. Hence the following four questions define a matrix of sixteen cells that suggest the possibilities:

• Do the items specified in the futures contract have markets?
• If so, are cash price quotations or futures price quotations used to compute cash settlements?
• Further, are cash settlements mandatory or are they optional to one or both parties?
• If the items do not have markets, does a governmental agency or a private agency provide the final numbers that are used to compute cash settlements?

Of the sixteen cells shown in figure 5–1, six are empty on purely logical grounds (the shaded area). That is to say, cash settlement is mandatory if the number used to fix the value of the futures contract at maturity has no market. Of the ten remaining cells, three have examples drawn from the real world, two have examples in proposals before the CFTC, and two are illustrated by proposals in case studies. This leaves three blank cells to be filled or abandoned.

The A cell in figure 5–1 is of major interest as illustrated by the current and proposed uses of cash settlements (see table 5–1). Most of these settlements are mandatory and are based on cash prices. The A' cell reveals some minor but interesting uses with the rise of trading in derivative contracts wherein one futures contract is settled on the basis of closing prices of another. The small denomination Treasury bill futures contract traded on the Mid-America Commodity
FIGURE 5–1
TYPES OF CASH SETTLEMENT CONTRACTS

<table>
<thead>
<tr>
<th>Cash settlement is</th>
<th>The item used to set the value of the futures contract at settlement is a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The item used to set the value of the futures contract at settlement is a</td>
</tr>
<tr>
<td></td>
<td>a cash market</td>
</tr>
<tr>
<td>mandatory</td>
<td>A Eurodollars (CME) stock index (various exchanges) potatoes (NYME)</td>
</tr>
<tr>
<td>optional to the buyer</td>
<td>B iced broilers (1972–1979, CBT)</td>
</tr>
<tr>
<td>optional to the seller</td>
<td>proposed for a Thailand corn futures contract</td>
</tr>
<tr>
<td>optional to the buyer and seller</td>
<td>D potatoes (proposed in USDA Tech. Bull. 1636)</td>
</tr>
</tbody>
</table>

Note: The above classification results in sixteen cells, six of which are empty by definition (shaded area). Of the other ten cells, three have real world examples, two are proposals before the CFTC, two are proposals made in case studies, and three remain unresolved. For explanation of the abbreviations of the names of commodity exchanges see notes to table 5–1.

Exchange (MCE), for example, is settled on the basis of closing prices for the larger and more active Treasury bill futures contract traded on the Chicago Mercantile Exchange (CME). Similarly, a soybean meal contract traded on the MCE is settled using prices for the futures contract traded on the CBT. This arrangement was made to avoid troublesome delivery problems.

Another application of the A' cell is reflected in various proposals...
### Table 5-1: Current and Pending Futures Contracts Having Cash Settlement Provisions, May 31, 1985

<table>
<thead>
<tr>
<th>Status and Type of Contract</th>
<th>Market</th>
<th>Date Begun</th>
<th>Open Interest</th>
<th>Number of contracts ($ millions)</th>
<th>Cash Settlement Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial instruments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eurodollars index</td>
<td>CME</td>
<td>January 1982</td>
<td>120,272</td>
<td>130,730</td>
<td></td>
</tr>
<tr>
<td>Value Line Stock Average</td>
<td>KCBT</td>
<td>February 1982</td>
<td>8,634</td>
<td>8,634</td>
<td></td>
</tr>
<tr>
<td>90-Day Treasury Bills</td>
<td>MCE</td>
<td>April 1982</td>
<td>513</td>
<td>513</td>
<td></td>
</tr>
<tr>
<td>S &amp; P 500 Stock Price Index</td>
<td>NYFE</td>
<td>May 1982</td>
<td>6,937</td>
<td>3,264</td>
<td></td>
</tr>
<tr>
<td>NYSE Composite Index</td>
<td>CMBT</td>
<td>July 1983</td>
<td>7,693</td>
<td>7,693</td>
<td></td>
</tr>
<tr>
<td>S &amp; P 100 Stock Index</td>
<td>CBT</td>
<td>July 1984</td>
<td>243</td>
<td>243</td>
<td></td>
</tr>
<tr>
<td>NYSE Consumer Price Index</td>
<td>CBCT</td>
<td>June 1984</td>
<td>1,830</td>
<td>1,830</td>
<td></td>
</tr>
<tr>
<td>Bond Buyer Index</td>
<td>NYME</td>
<td>June 1983</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NYSE quotes</td>
<td>CBT</td>
<td>May 1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NYSE quotes</td>
<td>CME</td>
<td>June 1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pending before the Commodity Futures Trading Commission</td>
<td>CBT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial instruments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petroleum Index, 10 stocks</td>
<td>CBT</td>
<td>May 1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information and Processing Index, 10 stocks</td>
<td>CME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S &amp; P 500 Utility Index</td>
<td>CBE</td>
<td>May 1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S &amp; P Hi-Tech Index</td>
<td>CME</td>
<td>May 1985</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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| S & P Over-the-Counter Industrial Stock Price Index | CME |
| NASDAQ 100 Index | CBT |
| National Over-the-Counter Index | PHBT |
| AMEX Major Market Index Maxi | CBT |
| U.S. Dollar Index | NYCE |
| European Currency Unit | NYCE |
| European Currency Unit | CME |

**Commodities**

- Commodity Research Bureau's Futures Price Index
- Soybean Oil
- Feeder cattle

**Economic indicators**

- Retail New Car Sales Index
- Housing Starts Index

**Manufacturers' Earnings Index**


Some non-U.S. commodity exchanges also trade in futures contracts that have cash settlement provisions. Among these is a Eurodollar contract that began trading on the London International Financial Futures Exchange (LIFFE) in September 1982; on May 31, 1985, there were 19,558 open contracts valued at $18,000 million. The most unusual contract is for an ocean freight rate index that began trading in May 1985 on the Baltic Exchange (BE) in London and on the International Futures Exchange (INTEX) in Bermuda. This is the first use of cash settlements to trade futures contracts in a set of physical services.

- LIBOR = London Interbank Offer Rate, which is quoted in the daily in the *Financial Times*.
- Average month-end open positions, October 1984–April 1985.
- Based on U. S. Department of Agriculture cash price quotations.
to trade an index of several futures contracts, each one representing a different commodity or financial instrument. The cash settlement of the derivative futures contract would be determined by an average of closing quotations for the individual futures contracts that are included in the index. Manipulation of the settlement price of an index composed of several futures contracts is less likely than manipulation of the settlement price of any of the component contracts.

The B and C cells do not have the general importance of the A cell. Yet optional cash settlements may be used to advantage in selected cases to balance out an uneven distribution of market power. As stated before, this consideration led the CBT to give buyers of iced broiler futures the choice of cash settlement. A seller's option to make a cash settlement might be useful where the bargaining power of buyers is stronger than that of sellers. Most long positions in a commodity, for example, may be held by a few large processors, whereas most short positions may be held by speculators and small producers. The need is to lessen buyers' opportunities to squeeze the shorts by demanding delivery if such delivery becomes costly.

The nature of the D cell is illustrated by a proposal made in a USDA study of the Maine potato market. It accords both buyers and sellers the right to elect cash settlement. To the extent that the preferences on both sides of the contract do not match up, a side-payment would be made to those who prefer delivery but have to accept cash settlement. Schemes such as this may be appropriate in cases where delivery is fairly costly; but cash price quotations, though plentiful, are not sufficiently accurate or immune from manipulation to be used as the sole basis for determining the value of a futures contract.

In sum, the matrix in figure 5-1 provides a conceptual inventory of the different forms that cash settlements could take. It should help broaden one's thinking about the possibilities beyond the confines of the A cell.

**Present and Proposed Cash Settlement Contracts.** Eleven contracts now traded in the United States require cash settlement. Six are contracts in stock index futures, one in Eurodollar loans, one in an index of municipal bonds, one in minicontracts for Treasury bills, one in minicontracts for soybean meal, and one in storage potatoes. Trading in the CPI is scheduled to begin June 1985. Pending before the CFTC as of May 31, 1985, were fifteen new cash settlement contracts. Nine were for financial instruments, three for commodities, and three for economic indicators using quantity variables. Some of these proposals cover entirely new ground for futures trading.

To date, the largest total open positions in cash settlement contracts
in the United States were in Eurodollar futures and in Standard & Poor's 500 stock index futures—two of the earliest of such trading vehicles (see table 5–1). The growth experience over three years for the five leading cash settlement contracts is shown in figure 5–2. This is evidence enough of the workability of cash settlement methods for liquidating such futures contracts. The nature of these methods, which are quite different for stock index futures than for Eurodollar time deposit futures, is examined in a later section.

Some Fundamental Price Concepts

Definition of Arbitrage. Market prices are kept in line through arbitrage. The term as used here refers to the simultaneous purchase of cash commodities or futures in one market against the sale of cash commodities or futures in the same or a different market. This generic sense of the term covers a variety of activities having similar price effects. It includes spreading and switching as well as some aspects of hedging. The technical meaning of the term is much narrower and will not be used here.

Normal Relationship between Cash and Futures Prices. When arbitrage is effective, the following relationships between cash and futures prices would occur apart from transaction and related costs. For storable commodities, the difference between the futures price and the cash price, on a given date, would be equal to the marginal cost of providing the services that are needed to turn the spot commodity into the futures commodity, less any "convenience yields" that may accrue to owners of the spot commodity during the interval.

For corporate stock, the spot-futures price differential would be equal to the forgone interest income on the current value of the stock minus the expected dividend income during the holding period. For debt instruments, the price of a spot loan, when averaged with the price of a future loan that begins at the finish of the spot loan, would equal the price of a spot loan that is coterminus with the future loan. For foreign currency, the spot-futures price differential would be equal to the difference in the interest rate for each of two spot loans of similar maturity and safety, but one of which is denominated in the foreign currency and the other in dollars.

When prices get out of line with the above relationships, profitable arbitrage opportunities may appear. If the contract calls for physical delivery, someone could buy the spot item and sell futures
FIGURE 5-2
MIDMONTH OPEN POSITIONS IN FIVE CASH SETTLEMENT FUTURES
CONTRACTS, JUNE 1982–JUNE 1985

Thousand contracts

whenever the price spread exceeds the anticipated costs (or yields) and later deliver the item on the contract. Or if the spread falls short of costs (or yields), someone could sell the item from current inventory and buy the futures contract. When the futures contract matures, the trader could take delivery and replace the inventory. Thus the ease of delivering on a futures contract keeps cash prices and futures prices in line.

If the futures contract calls for cash settlement, the arbitrage procedure would be the same, except for terminating the spread. Instead of delivering or taking delivery of the item on futures, the item is sold or purchased in the spot market and the futures position is settled with a money payment based on current cash price quotations. Assuming that cash quotations accurately reflect commercial values, the relative effectiveness of arbitrage under the alternative methods of terminating spreads would depend on the relative transaction costs in the two cases. The conclusions probably would be different for different types of items.

A Restatement of Theory: The Effect of a Delivery Sequence on Prices during the Delivery Month. Delivery contracts may be divided into two groups. In one, deliveries are made only after trading stops—as for most financial instruments. Historically, some commodity contracts—live cattle before 1969, frozen orange juice before 1975, and Maine potatoes from 1959 to 1983—had this feature. In the second group, the period for deliveries and for trading in the contract overlap. Most futures contracts for agricultural commodities have this feature. If the seller elects to deliver, he or she must choose when to do so within two or three weeks.

Theory holds that the futures price would remain constant, assuming that the price discounts all known events affecting the spot price at contract maturity and that nothing new happens in the interim. The spot price would increase gradually over the life of the futures contract to cover accumulated storage costs or to cover income accruing on financial claims, and it would converge with the futures price at contract maturity (see figure 5–3). This classical depiction of the relation between cash and futures prices abstracts from the sequencing of deliveries in the delivery month. In the case of storables, the theory should be modified to reflect that storage costs would be incurred from day to day and that sellers would have the choice of when to deliver. Theoretically, the spot-futures spread need not exceed more than one day's carrying charge because of arbitrage possibilities enjoyed by traders who hold
FIGURE 5–3
NORMAL CASH–FUTURES PRICE RELATIONS FOR STORABLE
COMMODITIES UNDER DIFFERENT CONTRACT SPECIFICATIONS, MARCH
FUTURES CONTRACT

Price per unit

3.30
3.25
3.20
3.15
3.10
3.05
3.00
2.95

November December January February March

Segment in life of March contract

Futures price with delivery or cash settlement after trading ceases

Futures price with overlap of trading and delivery

Cash price

Overlap period

Note: Prices per unit are hypothetical.

commodity stocks at the futures delivery point. Thus, from the first day of delivery to the end of trading, cash and futures prices would tend to rise together.

Relation of Price Patterns to Hedging Uses. One one hand, the tendency for the futures price to become a cash price during the delivery month means that the use of the contract for hedging purposes is more specialized. On the other hand, futures contracts that cannot be delivered upon until trading stops maintain their forward pricing function. Yet the latter delivery specifications are generally avoided, suggesting that their use has created other problems.

On this count, the cash settlement process seems like an improvement because it would provide a forward price for the maturing contract throughout the delivery month while side-stepping the costs of delivery. It is a demanding process, however. It requires
accurate readings of competitive cash prices for the commodity at futures contract maturity—prices that are relevant to hedgers.

Considerations in Specifying Cash Settlement Procedures. In highly organized markets for fully standardized items, an accurate reading of the cash price at the close of futures trading is feasible. In other markets, however, a single cash price that would accurately measure changes in commercial values is less likely to be discovered. A family of price quotations would be more likely to represent the important variants of the item. Differences among such price quotations, however, might reflect other things, like the different timings of transactions or the costs of market searches.

One way to narrow these ambiguities is to average price quotations for only the modal qualities and locations and then average across a span of time to avoid momentary price idiosyncracies. Still, this procedure raises questions about the meaning of average price quotations to differently situated hedgers. It could increase or decrease individual risk, depending on the situation of the hedger. The problem needs to be explored in concrete situations.

Distinction between Pricing Commodities and Pricing Financial Assets. Clearly, in markets for financial assets, geographic location of the financial claim is unimportant in determining price. And for many financial claims, there are no variations in quality of different batches of a given specification—such as Treasury bills, corporate stock, and foreign currency. Hence, in such cases, the main problem in using cash prices to settle futures contracts is whether averaging across time would appreciably reduce the effectiveness of hedging.

Commodities are different. Geographic location affects price because transportation of bulky items is expensive. The dispersion of economic activity involving a commodity gives rise to a "price surface" wherein the cash price for the commodity at any one location differs from its cash price at any other location by no more than the cost of transport (and transaction) between the two locations, or by no more than the difference in transport costs from each location to or from a third location.

To the extent such geographical price relationships are stable, price quotations drawn from only one location could accurately represent the entire market. Otherwise, averaging prices for several locations would be a more reliable statistic with which to measure changes in the general level of cash prices. Whether such an averaging process, to fix the price of futures contracts, would increase or decrease
individual risk, as compared with a contract that calls for delivery at a single location, would depend on the locus of stocks owned by the principal hedgers. This becomes an empirical problem.

The effect of averaging cash price quotations across time, to avoid the idiosyncracies of momentary prices, is to invite another difficulty. The longer the reading period, the more likely the equilibrium price for the item will change. Because the stability of price differs from item to item, the choice of the reading period should differ to achieve the best trade-off between increased reliability of the cash price quotation and increased likelihood of a change in its equilibrium price.

The optimum reading period for an item, however, also depends on the composition of the hedging interest. The outcome of long-period hedging, for example, would be less affected than the outcome of short-period hedging by changes in equilibrium values over the reading period. Moreover, some hedgers could nullify the effects of shifts in equilibrium prices during the reading period by unwinding their hedges evenly through that period. Thus the question of whom the futures market is primarily supposed to serve must enter into the decision on how to design the cash settlement.

**Types of Cash Price Quotations and Their Uses.** Cash price quotations represent actual transactions, bid and asked prices, or reporters’ perceptions of the market. Transaction prices may be arrived at by auction, by private negotiation, or by simple acceptance of posted bids or offers. The representativeness of price quotations from these sources depends on the homogeneity of the items and other terms, the frequency of transactions, and the fidelity of the price-reporting mechanism.

If either standardization of terms or the open auction is absent, for example, price quotations can become fairly inaccurate. If variable qualities of an item are sold at auction, the transaction price can be accurately quoted, but the quality description for the item may contain important inaccuracies. Hence, different price quotations for different lots may reflect true price differences or only value differences for different qualities, or some mixture of the two. Thus to get representative price quotations requires a tolerably accurate grading system and the use of objectively determined grades.

The problems that arise when standard items are traded by nonauction methods are illustrated by trading securities in over-the-counter markets. Dealers give out their bid and asked prices, which might show the range in which most of their transaction prices fall, or might represent the high and low prices received by the dealer
within the trading session, or might represent something else. Obviously, the problem of determining what the price quotations represent would multiply where nonstandard items are traded in nonauction markets.

Price reports for privately negotiated trades must be secured on a voluntary basis from buyers, sellers, or their agents. In central markets for commodities, professional reporters can talk to many traders, and they might examine the quality of goods firsthand. In dispersed markets, the telephone is the basis of communication, and goods cannot be readily examined. Evidently, for someone to become an effective reporter takes much time in the commodity trade where personal relations with its members must be developed and guarded. Therefore experienced reporters learn to ascertain which traders provide reliable information and which do not. Thus the reporter's assessment of the individual contributor of information may be more important than any formal procedure for assuring reporting accuracy. Statistical sampling procedures are not used; rather, the reporter strives for a complete survey of known and reliable trade sources. Ultimately, acceptance by or complaints from users of price reports must play a major role in maintaining their quality.26

If some commodity exchanges were to become clients for either government or privately gathered price reports, attention would indeed be focused on the quality of the reports. Usually there is room for improvement. The ultimate weakness of any voluntary price reporting scheme, however, is the difficulty of carrying through an effective audit program.

Having made these cautionary observations, I should say that cash trading arrangements vary greatly, leading to variation in their usefulness for cash settlements. An example of meaningful price quotations arises from the practice of the country grain trade to buy from farmers at posted prices. While posted prices for many manufactured products belie their transaction prices, they do not appear to do so in the dealings between farmers and country elevators. In a way similar to the daily posting of selling prices in retail food stores, country elevators each day post their offers to buy grain of different kinds, grades, and delivery dates for all to see. Grain elevators fix their offers in relation to the price of futures contracts, however.27

Settling Futures Contracts with Cash Prices Based on Futures. A difficulty seems to arise in using cash prices to settle futures contracts
when the cash prices have been based on futures price quotations in the first place. This seems like circular reasoning. Cash price bids in markets for grains, soybeans, cotton, sugar, and some other commodities are commonly based on concurrent futures prices, so elevators, merchants, or processors bid for “No. 2 Yellow Corn” at “20 [cents per bushel] under December [December futures price quotations].” How then can one justify using such cash prices to determine futures prices?

The key to the answer is in recognizing the distinction between the functions of “price basing” and “price determination.” The former is a mechanical or accounting phenomenon whereas the latter is an economic phenomenon. For example, a country elevator that bids for farmers’ grain at twenty cents under December one day, may raise the bid to ten cents under the next day if too little grain was acquired at the former bid. If too much was received, the bid might be lowered to twenty-five cents under. Thus, under the mechanics of price basing, the elevator simply lowers or raises the posted price differential to attract more or less grain. In other words, the price differentials are competitive prices reflecting, by their changes, changes in local supply and demand conditions.

In principle, it would not matter whether most independently derived cash prices were to disappear from the market, so long as basis pricing were sensitive to changing local supply-and-demand conditions. The concern that the decline of independent pricing and the rise of formula pricing erodes the function of price in the economic adjustment process turns out to be a concern that the price differentials are not reset as accurately or as often as they should be. The validity of this criticism would have to be judged in each market against empirical observation. The foregoing problem is a particular instance of the general tendency to use formula prices in markets for agricultural products.

That price differentials set on futures prices do not change as often as the futures prices has a bearing on the appropriate length of the reading period. Thus price differentials that are not sensitive to changes in market conditions within the day might be more sensitive from day to day and even more from week to week. The length of the reading period should take this matter into account. The important question is how well this feature of contract design would meet different hedging needs.

The Squeeze as a Pricing Aberration. Futures contracts that require physical delivery often have some pricing imprecision during the closing period of trading. The cause is the extra cost of making and
taking delivery in the futures market compared with doing so in the cash market. The shorts bear the costs of issuing delivery notices; handling, inspecting, and certifying the commodity; and transferring records. They can also incur extra shipping, storage, and handling charges. The longs who must take delivery usually must pay in full by certified check. They also may have to dispose of unwanted grades or locations of the commodity. Together such added costs of making and taking delivery on futures create a zone in which futures prices fluctuate independently of cash prices. Within this zone, which usually is small, most futures positions are extinguished by offset before the final bell.

When such delivery costs are large, however, the zone of independent price movement also will be large. In particular, the shorts may have substantial costs of procuring and transporting supplies from distant points, or premium grades may have to be delivered when par grades are in short supply. In the case of perishables, the shorts may have to replace loads that fail inspection. When faced with the prospective delivery costs, most shorts would rather buy in their futures positions at premium prices to avoid the greater costs of making delivery. Such a rise in price of the maturing futures reflects a squeeze by the longs, whether or not it signifies manipulative intent.

Alternatively, the longs could be put at a disadvantage by the shorts. The longs may receive commodity lots of unwanted grades or at unwanted locations. Disposing of such deliveries could cause large losses. Faced with such prospects, the longs might choose to "run from delivery," that is, they might sell out their futures positions at lower prices than otherwise would prevail. Large hedgers sometimes can depress the price of a maturing contract by threatening to deliver, in order to roll-over their short positions to their advantage.28

Futures contracts in financial instruments, as opposed to commodities, may not be free of the problem of delivering lesser grades on the futures contract. The window of maturities deliverable on a futures contract for a debt instrument, for example, may straddle a sensitive portion of the "yield curve," causing some parts of the deliverable supply to be less valuable than other parts; or the quality of the debt instruments that are deliverable on futures may vary with the creditworthiness of the issuing party. Either condition may be hard to anticipate correctly and would put the longs at a disadvantage.

The better the design of delivery terms, whether for commodity futures or financial futures, the greater the number of contracts that
CASH SETTLEMENT

could be held to maturity without distorting prices appreciably. Yet the possible improvements in contract design usually are constrained by fundamental conditions within each economic sector.

The Case of Financial Instruments

To date cash settlements have been used mainly for financial instruments and not for physical commodities. The open interest in the principal cash settlement contracts has increased greatly since these contracts were introduced in 1981. Moreover, the number actually liquidated with a cash settlement has increased proportionately (figure 5-4).

The fear of having to take or make delivery on futures contracts drives many traders out of their futures positions before the contract matures. With cash settlements, traders stay longer with their contracts. As a result, the market probably is more liquid than otherwise; but it also might be susceptible to various pricing aberrations.

FIGURE 5-4
CASH SETTLEMENTS IN RELATION TO AVERAGE NUMBER OF OPEN CONTRACTS DURING THE LAST TEN DAYS, EURODOLLAR AND S&P 500 FUTURES CONTRACTS, JUNE 1982 TO MARCH 1985 Maturities

Cash settlements (thousand contracts)

SOURCES: Cash settlements from CFTC; open positions from the Wall Street Journal.
Cash Settlements of Eurodollar Futures versus Stock Index Futures.
The technique of arriving at cash settlements for stock index contracts
is quite different from that for Eurodollar contracts. For the former,
organized exchange trading in individual stocks (which are uniform
assets) greatly simplifies the task of determining the cash value of
the index at the close of the market. No special machinery is required
to report prices.

The Eurodollar market is different. The Eurodollar loans are
privately negotiated between banks of various financial standing and
primarily located in London. The futures contracts are for ninety
day loans in the form of time deposits at specified rates of interest.
The deposits are not transferrable, nor can they be withdrawn prior
to maturity except at a substantial penalty. Hence, such loans have
no secondary market, and they are fairly illiquid.

Yet, surprisingly, more than 90 percent of total Eurodollar depos­
ts take this form and not the form of Eurodollar CDs, which are
bearer instruments and have secondary markets. Understandably,
trading futures in Eurodollars, to be successful, must take place in
the larger market. Hence, special machinery had to be installed to
determine the cash settlement price.

If physical delivery had been required for either Eurodollars or
stock indexes, the futures markets probably would not have devel­
oped; but the reasons would have been different. In the case of broad
stock indexes, the costs of assembling and transferring the requisite
certificates, including odd lots and fractional shares in the propor­
tions required by the contract, would have been prohibitive. In the
case of Eurodollar time deposits, the item traded is not transferrable
and has no secondary market. Moreover, if futures trading were in
the form of CDs, it might have had to face the problem of the shorts
tendering different qualities of CDs—a problem that is neatly solved
with cash settlements by the averaging of credit risks of participating
banks.

The scheme for cash settlement of Eurodollar futures is based
on the premise that the market in ninety-day Eurodollar time deposits
is sufficiently active and competitive to permit a reliable reading of
the current interest rate on such loans by simply asking a sample of
major banks, heavily engaged in such borrowing and lending, to
give their own perceptions of the offer price as of any given time.
To mitigate inaccurate and biased reporting, three devices are used:
the random selection of reporting banks, the random selection of
one of two time periods the market is to be quoted, and the casting
out of extreme values from computation of the index.

It is significant that a workable cash settlement scheme has been
CASH SETTLEMENT

erected purely on the reporting of perceived prices. Whereas written confirmations of the telephone reports exist, there are no final audits. Evidently, the casting out of one-third of the sample results is an effective means of filtering out price quotations that reflect special situations or biases. In any case, this step probably instills confidence in the accuracy of the cash settlement price.

Comparative Price Behavior. A central question is whether the cash prices could be distorted when they are used to settle futures contracts. The empirical evidence, though scant, raises some concerns.

According to one statistical measure, the Eurodollar contract has shown no signs of price distortion whereas the Standard & Poor’s 500 contract has shown such signs. The measure is the relation between the closing price of the maturing contract and that of the next contract during the final month. Their ratio, or percentage relation, should reflect the current shape of the yield curve for secure loans carrying different maturities. Hence, when the ratio reacts only to changes in fundamentals, its fluctuations should be the same for loans of different types having the same maturity. For example, the percentage relation of June and September futures prices should fluctuate in the same direction for Eurodollar time deposits as for bank CDs, if each is for ninety days.

This expectation is borne out in nine of eleven daily movements of the two price ratios shown in figure 5–5 (top panel). No comparisons beyond eleven observations are possible because the Eurodollar contract had matured by then, whereas the bank CD contract had not. This is fortuitous. The bank CD ratio can be used as a reference point by which to judge whether prices had been distorted at the close of trading in the Eurodollar contract. Visual inspection shows no obvious sign of distortion either in the June-September ratio or in the other ratios shown in the lower panels.

A similar analysis can be made of the Standard & Poor’s 500 stock index futures contract, using the NYSE Composite Stock Index futures contract as the base. Again, the Standard & Poor’s contract matured earlier than the reference contract. Ratios, comparable to those shown for interest rate futures in figure 5–5, are shown for equities in figure 5–6.

As one might expect, the correlation of daily movements of the two ratios does not appear as high as for the interest rate contracts. Even though the two stock indexes are intimately related—one being a large subset of the other—close arbitrage is difficult and costly because many stocks would have to be traded in the cash market. Nonetheless, one can discern a definite change in the relation of the
FIGURE 5-5
FUTURES CONTRACTS IN EURODOLLARS AND BANK CERTIFICATES OF DEPOSIT, PERCENTAGE PREMIUM BASED ON CLOSING PRICES FOR THE DEFERRED CONTRACT OVER THE NEAR CONTRACT DURING THE FINAL MONTH OF TRADING

In the three cases shown, the spread between the price of the maturing futures and the next futures widened at the close of trading in the maturing futures, compared with the spread at the close of the previous day. The increase in price for the deferred contract relative to the price of the maturing contract, net of any change in the two ratios on the last day of trading in the Standard & Poor's futures contract.
FIGURE 5–6
FUTURES CONTRACTS IN S&P 500 AND NYSE COMPOSITE: PERCENTAGE PREMIUM BASED ON CLOSING PRICES FOR THE DEFERRED CONTRACT OVER THE NEAR CONTRACT DURING THE FINAL MONTH OF TRADING

Percent
2.5
2.0
1.5
1.0

S&P 500
NYSE composite

June–September spread 1984

Business Days in June 1984

2.5
2.0
1.5
1.0

S&P 500
NYSE Composite

March–June spread 1984

Business Days in March 1984

2.5
2.0
1.5
1.0

S&P 500
NYSE Composite

December–March spread 1983–1984

Business Days in December 1983

the relation of the corresponding NYSE contracts, was 0.65 percent for June-September, 0.28 percent for March-June, and 0.43 percent for December-March.\textsuperscript{36}

The widening of the spreads means either that the price for the deferred futures contract had increased or the price of the maturing futures contract—which at the close coincides with the index based on cash prices—had declined, or both. Thus two opposing hypotheses arise. A decline in the cash index implies that some large-scale selling took place at the close of the stock market, which served to depress the broad-gauged index. The other hypothesis is that there was bunching of roll-overs at the close of trading in the expiring futures contract that had moved the price of the next futures contract temporarily onto higher ground—an indication of insufficient liquidity of the next maturity. This hypothesis seems less likely to be sustained.

To choose confidently between the two hypotheses requires more data. Yet recently some experienced traders have observed that the cash settlement of futures contracts in the Standard & Poor's 500 stock index has led to the bunching, at the close of the stock market, of sales of big blocks of the principal stocks in the index, as large arbitrage positions were unwound. Evidently, this action temporarily destabilized the cash market.\textsuperscript{37}

A question is why the cash settlement must be based on the closing price. Why not average the prices for stocks at different times near the close, or over a longer period? The answer requires an evaluation of the trade-off between resistance of prices to distortion and the precision of hedging results. Because some users of stock index futures carry hedges over long periods while others carry them over short periods, the optimum solution calls for a study of the possible compromises.\textsuperscript{38}

\textbf{Narrow versus Broad Indexes.} The matter becomes important when one ponders the feasibility of trading indexes that represent individual industries. Many investors may be interested in an efficient way to rebalance their portfolios, based on an industry's prospects, without having to evaluate the managerial capacities of individual companies.

In an original proposal, the CBT had proposed to trade in ten industry indexes, each containing five stocks.\textsuperscript{39} The problem, of course, is that the fewer the stocks in an index, the more vulnerable to distorting influences the index becomes. In such cases, it may be particularly important to stretch the reading period over several parts of the day or over several days and to introduce a random component into the reading process.
Moreover, with small numbers of stock issues in an industry index, the option of delivering stock certificates might be given to the shorts. The shorts might not wish to enter the game of maneuvering the price of the stock during the reading period by selling their shares and allowing their futures contracts to be settled on the basis of cash prices.

**Problems of Futures Trading in Debt Issues.** Cash settlements may be usefully considered for two problems in trading debt issues. As noted above, the Eurodollar experience suggests that cash settlements would avoid the possibility of delivering lesser qualities of debt issues at delivery time. The qualities on which futures settlements are based are rendered uniform by averaging. How far this principle can be applied to other types of debt issues is a moot question. When the qualities of individual issues can change in a relatively short time, the meaning of the index would tend to become unstable. This tendency would be inimical to futures trading, but there might be some ways to moderate it.

The second problem has little or nothing to do with the quality of the debt issue. Rather it is the fear that the deliverable supply of a debt issue might become scarce relative to the demand and result in a market squeeze. There has been a particular concern about this for ninety-day Treasury bills. The squeeze would result from limitations on the amount of such debt that the Treasury would elect to issue at the futures delivery date, from the size of past debt issues bearing the same maturity date, and from the willingness of holders of the existing and newly issued debt to sell their holdings to others who wish to deliver on futures. If this concern were sustained, it would raise a question of whether a cash settlement option should be given to the shorts to make squeezes unlikely.

**Foreign Currency Futures.** The main question about foreign currency futures is whether the unusually high rate of deliveries denotes deficiencies in the futures contract specifications. Apparently it does not. Delivery of foreign currency, whether to satisfy forward cash contracts or futures contracts, can be done at relatively small cost. The forward cash market, operated through interbank dealings, usually involves large denominations, however. The lowest exchange rates are given for deals involving a million or more U.S. dollars. Such deals exceed the dollar value of futures contracts by a factor of twenty or more. Hence, for the smaller business users, the futures market provides a cheaper way of acquiring or disposing of foreign currency than by dealing with banks.
In short, deliveries on currency futures have a valid place in the scheme of things. The use of cash settlements would deprive many businesses of an efficient means to satisfy their foreign currency needs. Perhaps the most interesting aspect of the matter is that the currency futures market serves a substantial merchandising function without impairing the serviceability of its hedging function. This contradicts the traditional perception of an ideal futures market with few if any deliveries.

Retrospect. Trading in financial futures runs the gamut from those futures that must use cash settlements (as stock index futures) to those that are better off requiring physical delivery (as foreign currency futures).

An interesting phenomenon is the specialized role that futures trading seems to play in stock indexes. Traders have a strong tendency to bunch their positions into the near month and neglect deferred months. Such actions challenge a long-held tenet, namely, that futures trading is first and foremost an institution of the forward market. The observed use of stock index futures deemphasizes the importance of the temporal structure. What is the reason?

The difference in the character of the various financial items for which futures contracts are traded, rather than the difference in the method of liquidating the contracts, is likely to determine whether or not futures trading will result in a well-developed temporal structure. The bunching of corporate equities into the near month may result because, unlike the contracts for Eurodollar deposits (which use cash settlements) or those for other debt instruments (which are settled by delivery) the value of corporate equities derives from a lack of time limits for receiving residual income. The main factor that determines the temporal price structure for common stock over a year or two is the short-term rate of interest. Clearly, there are better vehicles for taking market positions on the future course of interest rates than stock index futures.

Apparently, the usefulness of a stock index futures contract is largely independent of the date for which delivery is called. Virtually all the liquidity is built into the market for the near contract, which facilitates the efficient positioning of corporate equities to meet perceived portfolio needs. Conceivably, shares in an investment trust with the same composition of stocks that the futures contract calls for could serve the same purpose. Perhaps, then, the explanation of the success of futures trading in broad-based common stock indexes is to be found in the reason trusts have not arisen to serve the purpose now served by futures trading.
Finally, in respect to the use of cash settlements, the important problem is to find the best technique for fixing settlement prices under different situations in which cash settlements could serve a useful purpose. The aim is to find the best trade-off between minimizing undesirable price behavior during the reading period and maximizing the precision with which the contract establishes prices.

The Case of Physical Commodities

The term *physical commodity*, as used here refers to goods and services as opposed to financial claims. For simplicity, the adjective *physical* is deleted when the meaning is clear without it.

At present, only three futures contracts in commodities call for cash settlement, two of which started trading in 1985. Each contract represents a different direction for the evolution of futures trading through cash settlements. One direction extends into commodity price indexes. Another extends into minicontracts. A third extends into contracts for commodities that have become severely troubled by physical delivery requirements. Each of these directions merits separate discussion.

**Commodity Price Indexes.** The beginning of trading in the CPI in 1985 is recognition that substantial price instability characterizes money as well as commodities and that many interests could be served by the development of a direct way to hedge against changes in the value of the dollar. Markets in interest rate futures provide an indirect but less precise way. The profound question is whether futures trading in the CPI, if it develops, would moderate or exacerbate inflationary tendencies in the U.S. economy. Exploration of this question is beyond the scope of this paper.

Futures trading in a broad price index like the CPI requires cash settlement. It is unthinkable that anyone could deliver the four hundred or so items (services as well as goods) in their exact proportions and at the locations indicated by CPI price collection points.

Trading on a broad index requires an elaborate reporting system. With a broad price index, however, some of the problems of getting a consistent and representative reading of the desired price level are simplified. Respondent errors and biases in individual price quotations tend to cancel one another. Prices for the CPI are collected by the Bureau of Labor Statistics (BLS) from about 24,000 establishments in eighty-five metropolitan areas.

Sooner or later, questions about the possibilities of trading futures contracts in different commodity price indexes to serve different
needs are bound to arise—for example, the feasibility of trading in the food or housing component of the CPI. Other broad indexes like the BLS Producers Price Index might be considered for trading. Because each proposal must include a cash settlement procedure, the adequacy of the statistical basis for arriving at a reliable settlement price would have to be evaluated—a matter on which lessons from trading the CPI might eventually shed some light.

Finally, the extension of futures trading to commodity price indexes raises questions about the adequacy of the systems by which the security of the information is ensured before its release. While a security system was in place for guarding the CPI data well before the issue of futures trading arose, the system needs to be enhanced because the information that is now guarded would become even more valuable if futures trading were to develop.  

**Minicontracts for Commodities.** The twenty or so minicontracts traded on the MidAmerica Commodity Exchange (MCE) are one-half or, in the case of grains and soybeans, one-fifth the size of corresponding contracts traded on other exchanges. They appeal to small commercial users of futures contracts as well as to small-scale speculators. Until 1983 all minicontracts held to maturity were settled by physical delivery. Then trading in a ninety-day Treasury bill contract on the MCE was begun with cash settlement based on the CME settlement price for its corresponding futures contract. This was done ostensibly to avoid adding to the delivery demand for Treasury bills when the available supply is small. In 1985 the MCE started trading in soybean meal minicontracts that have their settlements based on CBT prices for corresponding futures contracts. Had physical delivery been required, the minicontract probably would not have traded. Processors apparently do not like to load soybean meal in less than rail car lots. The minicontract calls for truckload lots, which better fit the needs of small feeders and feed manufacturers.

An important rule is that the cash settlement price for soybean meal is the average of the settlement prices for the corresponding CBT contract on the last three days of trading in the MCE contract, which trading is to end five business days before the last day of trading in the CBT contract. This rule lessens the probabilities of distortion of the MCE cash settlement price through happenstance or plan.

A 1983 proposal to switch the MCE live hog minicontract to cash settlement, to avoid the complications of physical delivery, has been under review. The occasional lack of depth in trading the CME
futures contracts, on which cash settlements would be based, however, has raised concerns over the reliability of the proposed method for determining the cash settlement.

The three cases just sketched suggest that other possibilities for using cash settlements would have to be investigated on their own merits. Each case suggests that actual or potential difficulties in making physical delivery on minicontracts may be enough to warrant switching to cash settlement methods, providing no greater problems would be encountered in using such methods.

Existing Commodity Contracts with Severe Delivery Problems. The major difficulties likely to be encountered in using cash settlements to liquidate existing futures contracts for a commodity having severe delivery problems will be examined in a sequence of related topics.

Usable price quotations. The existence of good cash prices for a commodity is a necessary condition for developing a workable cash settlement scheme. Good cash price quotations are those that are tolerably accurate, relevant, widely accepted, fairly continuous, and hard to manipulate. These requirements are rather stringent and greatly limit the potential use of cash settlement for commodities.

Transaction prices generated in the cash market, for example, may be too few for cash settlement purposes. Vertical integration may be the dominant cause as in the case of the frozen concentrated orange juice; or the trading unit may be very large as in the case of raw cane sugar, which normally trades by the boatload, thus requiring few transactions to meet U.S. consumption needs. Noncompetitive forces, like the international commodity agreements, could affect prices, as for coffee, rubber, and tin. Big firms might influence prices during the reading period, as could easily happen in the aluminum, copper, and petroleum industries. All such cases greatly narrow the field for cash settlements.

A remaining group of agricultural commodities has broad transactional systems and trade for immediate delivery on a fairly continuous basis during all or most of the year. The group includes fed cattle, feeder cattle, slaughter hogs, wheat, corn, soybeans, cotton, and storage potatoes. This list is not large, but it contains some of the most important products of U.S. agriculture.

Prices in markets in which farmers sell—called first-handler markets—are established in diverse ways (table 5–2). The auction is important for feeder cattle but not for the other commodities. Feeder cattle also are sold by private negotiation, either centralized (in public stockyards) or decentralized (by direct selling). Fed cattle
TABLE 5-2
PRINCIPAL METHODS FOR SELLING SELECTED FARM COMMODITIES AT THE FIRST-HANDLER LEVEL

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Open Auction</th>
<th>Posted Prices</th>
<th>Centralized negotiations</th>
<th>Decentralized negotiations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder cattle</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fed cattle</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hogs</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soybeans</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td></td>
<td></td>
<td>X*</td>
<td>X</td>
</tr>
<tr>
<td>Potatoes, round white</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Includes computer-assisted trading in the high plains of Texas.

are mostly sold by the latter two methods, whereas slaughter hogs and potatoes are mainly sold only by the latter method. The grain and soybean trades depend largely on posted prices—prices that country buyers fix in reference to current futures prices.

Conceivably, each of the methods of establishing cash prices could yield usable price quotations for cash settlement purposes. Differences would exist in the ease or difficulty of collection and verification. Moreover, first-handler prices would differ in how germane they were to the various hedging interests—that is, how closely the changes in price quotations at the first-handler level correlated with the changes in price quotations for a particular type or location of the commodity in which the individual hedger deals. Answers to this question would indicate whether a cash settlement scheme could improve hedging outcomes. Well-designed empirical studies could provide the answers.

The case of potatoes. The only experience in using cash settlements to solve difficult delivery problems is with storage potatoes. The lessons that can be learned for application to other commodities seem quite limited, however. Futures trading in potatoes was switched to cash settlements in 1983 because of increasing failures of potatoes to pass official inspection. The causes were traceable to some fundamental changes in potato production and marketing patterns in Maine that made the physical delivery contract unworkable.⁵⁵
After two years of trading under a cash settlement contract, the open interest in potato futures has reached about one-quarter of its average level during the 1960s and 1970s, suggesting that the cash settlement method employed has not yielded satisfactory results or else that it is too novel to be judged.56

The case of feeder cattle. Proposals to switch the feeder cattle contract to cash settlement stem from two problems. One is the uncertainty facing the commercial buyer, usually a feedlot operator, over which of eleven different delivery points—ranging from Montgomery, Alabama, to Billings, Montana—the shorts will choose for delivery. The other problem is the difficulty facing smaller ranchers in putting together uniform lots of feeder steers (weights, types, and condition) as required by the futures contract. Simulation studies suggest that basis risk can be reduced by using cash settlements based on price quotations for modal weights and qualities of feeder steers appearing in the principal feeder cattle markets—auctions and private trades—during one week.57

Getting access to a sufficient sample of relevant sales prices poses major difficulties, however. Larger auctions seem reluctant to supply information about transactions to be used in cash settlement because they have a vested interest in providing yardage services for the cattle that are delivered on futures contracts.58

Cases of incipient delivery problems. The geographical problem in writing a set of workable delivery terms for feeder cattle is not an isolated case. The feature of agricultural markets that perhaps has had the most effect on futures trading performance over the years is the continued decline of terminal market centers in receiving, storing, processing, and shipping farm products. As fewer stocks accumulate at the terminals, finding a set of delivery terms to encompass enough stocks at any one terminal to prevent price distortions becomes harder. Heterogeneous qualities of product add to the difficulties.

The data on the declining importance of terminal markets for farm products are dramatic. The receipts for wheat at thirteen primary markets, expressed as a percentage of farm sales, for example, declined from 46 percent in 1955–1959 to 9 percent in 1980–1982 (table 5–3). The receipts for corn declined from 27 percent to 7 percent and for soybeans, from 17 percent to 5 percent. For cattle, receipts at all public stockyards, expressed as a percentage of U.S. commercial cattle slaughter, declined from 67 percent to 26 percent. For hogs, the decline was from 30 percent to 13 percent (table 5–4).

These changes over the past quarter century increase the like-
<table>
<thead>
<tr>
<th>Years</th>
<th>Wheat Average farm sales</th>
<th>Wheat Average receipts at primary markets</th>
<th>Wheat Percent</th>
<th>Corn Average farm sales</th>
<th>Corn Average receipts at primary markets</th>
<th>Corn Percent</th>
<th>Soybeans Average farm sales</th>
<th>Soybeans Average receipts at primary markets</th>
<th>Soybeans Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955–1959</td>
<td>1,011</td>
<td>468</td>
<td>46</td>
<td>1,324</td>
<td>360</td>
<td>27</td>
<td>465</td>
<td>77</td>
<td>17</td>
</tr>
<tr>
<td>1960–1964</td>
<td>1,160</td>
<td>444</td>
<td>38</td>
<td>1,680</td>
<td>449</td>
<td>27</td>
<td>640</td>
<td>86</td>
<td>13</td>
</tr>
<tr>
<td>1965–1969</td>
<td>1,339</td>
<td>425</td>
<td>32</td>
<td>2,326</td>
<td>389</td>
<td>17</td>
<td>975</td>
<td>95</td>
<td>10</td>
</tr>
<tr>
<td>1970–1974</td>
<td>1,511</td>
<td>418</td>
<td>28</td>
<td>3,023</td>
<td>369</td>
<td>12</td>
<td>1,245</td>
<td>96</td>
<td>8</td>
</tr>
<tr>
<td>1975–1979</td>
<td>1,948</td>
<td>327</td>
<td>17</td>
<td>4,206</td>
<td>273</td>
<td>6</td>
<td>1,723</td>
<td>54</td>
<td>3</td>
</tr>
<tr>
<td>1980–1982</td>
<td>2,537</td>
<td>219</td>
<td>9</td>
<td>4,807</td>
<td>344</td>
<td>7</td>
<td>1,979</td>
<td>90</td>
<td>5</td>
</tr>
</tbody>
</table>

a. Average farm sales data are for the crops of the indicated years as given in the USDA’s 1982 Agricultural Statistics and earlier issues. The data for 1980–1982 were estimated from the ratio of farm sales to production in the 1975–1979 period.

b. The primary markets are Chicago, Duluth, Indianapolis, Kansas City, Milwaukee, Minneapolis, Omaha, Peoria, St. Joseph, St. Louis, Sioux City, Toledo, and Wichita. There could be some duplication in the data where grain arrivals at one market are shipped to another. Data from Chicago Board of Trade, Statistical Annual, 1982 and earlier years.
## Table 5-4

### Receipts of Cattle and Hogs at Primary Terminal Markets as a Percentage of Commercial Slaughter, 1955–1982

<table>
<thead>
<tr>
<th>Years</th>
<th>Cattle</th>
<th>Hogs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual commercial slaughter (million heads)</td>
<td>Annual receipts at public stockyards (million heads)</td>
</tr>
<tr>
<td>1955–1959</td>
<td>25.1</td>
<td>16.9</td>
</tr>
<tr>
<td>1960–1964</td>
<td>27.0</td>
<td>15.3</td>
</tr>
<tr>
<td>1965–1969</td>
<td>34.0</td>
<td>14.6</td>
</tr>
<tr>
<td>1970–1974</td>
<td>35.4</td>
<td>11.9</td>
</tr>
<tr>
<td>1975–1979</td>
<td>39.7</td>
<td>12.4</td>
</tr>
<tr>
<td>1980–1982</td>
<td>34.9</td>
<td>9.2</td>
</tr>
</tbody>
</table>

**Notes:** The data on receipts at public stockyards for 1955–1972 are from the *Livestock and Meat Statistics*, USDA Statistical Bulletin 522, to which have been added the figures for Chicago, Cleveland, and Denver for cattle, and Chicago for hogs, as shown in annual supplements. The 1973–1982 data are from the annual supplements. Because of additions and deletions to the list of reporting public stockyards, the totals in different supplements are not strictly comparable. The errors are slight, however.

The likelihood of price distortion. As a result, additional delivery points have been included on contracts that formerly had only one delivery point. Although this expedient limits squeezes by the longs, it introduces uncertainty over what the contract represents and, therefore, increases basis risk because anticipating geographical price differentials is often difficult. Thus the longs would discount the value of the futures contract by the uncertainty of just where the shorts will choose to deliver. The more delivery points that are added to the contract, the greater is the uncertainty of where the deliveries will be made and, therefore, the less serviceable the futures contract becomes for hedging purposes.

One way the exchanges have dealt with this problem is to add outside delivery points as safety valves against excessive squeezes by the longs, that is, to discount any deliveries made to outside locations that are more than are warranted by historical price relationships. This additional discount permits the value of the futures contract in most years to be determined by commodity values at the par location. Under unusual conditions, however, deliveries to the outside location would be the least costly way of liquidating short
positions. In other words, the safety valve puts a cap on the size of the squeeze.

The merits of this solution depend on the frequency of long squeezes. The data on declining supplies in central markets, while suggestive of increasing squeeze potentials, are not in themselves sufficient evidence. Much depends on the actual distribution of commodity stocks that lies concealed in the averages. If squeezes become chronic, cash settlements might improve matters. For commodities that move to market under large transactional systems, it may be possible to find a practical way to arrive at representative price quotations with which to settle futures contracts.

Dispersion of commodity quality. The more qualities a commodity has, the more difficult writing a set of specifications allowing homogeneous deliveries without increasing the number of delivery points becomes. If the number of delivery points were constricted, however, more grades would have to be made deliverable. This solution almost inevitably increases the uncertainty of what qualities the longs would receive on delivery and tends to increase their basis risks.

Conceivably, cash settlements would reduce such basis risk by specifying the average quality of a set of commercial grades as the par grade. The formula would be public knowledge, and it would be held constant over the life of the contract. Hence, the hedger need not be very uncertain over what average quality means. In sum, the individual grades that a hedger owns would be priced off the average grade rather than off the grade that happens to be cheapest.59

The question of manipulation. The manipulative potential would be the same under a cash settlement contract as under a physical delivery contract, if both the cash reading and the physical deliveries were confined to the par delivery point. The only difference would be whether, in one case, the manipulator bought the cash commodity to raise the cash settlement price or, in the other, the shorts bought the supplies to deliver them to the manipulator. To achieve a given price effect in either case would take about the same amount of capital.

Manipulation of cash prices becomes more costly if outside points are included in calculating the average price for the reading period. The manipulator would face a bigger market and would have to buy up supplies at all points at which prices enter into determining the cash settlement price. Adding outside delivery points to the conventional futures contract would accomplish the same thing, but it would bring uncertainty over where the commodity would be delivered.
The nature of the geographical price surface and the type and location of the principal hedgers would determine the optimum contract terms. Possibly no single set of contract specifications would adequately serve potential hedging needs, in which case side-by-side contracts might be tried.60

Retrospect. Although a few cash settlement contracts of different types have been put into practice for physical commodities, their rate of spread probably will be appreciably slower than for most financial instruments. This conclusion is based largely on the fact that the cash market for a commodity is typically composed of numerous thinly traded submarkets that differ with location and quality and, therefore, are hard to quote consistently and objectively in ways allowing aggregation across quotations. Yet wherever the transactional system for a commodity is large, deficiencies in the reporting of prices might be reduced by conscious effort and added investment, once the nature of the need is clearly identified.

Giving Traders a Choice of Liquidation Methods

Since making their debut three years ago, cash settlements in the United States have been used on an all-or-none basis. Yet, as already suggested, in some situations giving traders a choice might be better. The problem may take two different forms.

The Need to Provide One Side with a Choice. In some situations, a chronic imbalance of market power on one side or the other exists. Providing a choice of liquidation methods might strengthen the hand of the weaker party and increase its interest in futures trading. For contracts that specify physical delivery, the weaker side should be allowed to elect cash settlement. For contracts that specify cash settlement, the weaker side should be allowed to elect physical delivery. Thus with two parties to a contract, there might be four cases.

Three of the four cases can be readily suggested with examples. The case of iced broilers, in which buyers may elect cash settlement, has already been discussed. If inadequate deliverable supplies of Treasury bills were to become a recurrent problem, the sellers might be given the choice of either delivering bills or taking a cash settlement (perhaps based on prices quoted in the secondary market on the day following issuance of the bills). This arrangement would mitigate squeezes if supplies available for delivery were inadequate.

In the case of a narrow stock index futures using cash settlement, the shorts would be allowed to deliver the certificates. This arrange-
ment would make sense if the index were composed of relatively few stocks and had no odd lots or fractional shares. If cash settlements were mandatory, some longs who hold large blocks of the stock might seek to buy more during the reading period to drive up the cash settlement price while blocks held by other interests were precluded from being delivered.

Curiously, trading on organized exchanges in the equivalent of a futures contract for the narrowest of stock indexes—namely, for a single stock—already exists. Futures positions now can be taken indirectly in many stocks if one takes a position in both a put option and a call option. Therefore, why not allow delivery of certificates on narrowly based stock index futures contracts? The shorts would not elect to do so if they deemed it too costly.

The juxtaposition of the two cases just outlined (Treasury bill and narrow stock index futures contracts) suggests that the alternative in each case is given only because each case calls for the opposite method of contract liquidation. Why are the different methods used, however? While the answer is fairly obvious in the two cases, considering another case—the feeder cattle contract—is instructive.

As explained in the previous section, the continuing search by industry for a better feeder cattle contract arises from excessive delivery costs facing commercial traders. Buyers face the uncertainty of where the feeder cattle will be delivered, whereas sellers may face the uncertainty of whether their cattle will meet contract specifications without penalty. Hence cash settlements look like an attractive means to avoid both sets of problems.

Yet to get a good reading of cash prices may be difficult, and therefore one might decide with equal hesitancy to retain physical delivery or to switch to cash settlement. Whichever scheme is used, why not provide each side with the choice of how to liquidate the futures contract?

**Providing Both Sides with a Choice.** Allowing both shorts and longs opportunities to choose between delivery and cash settlement may be desirable in situations in which neither settlement method is fully satisfactory by itself. Perhaps the cash prices can be determined only with substantial random error, and any possible delivery scheme has serious problems of its own. Therefore, a combined delivery–cash settlement scheme may be indicated.

Under such a scheme, traders would express their individual preference for the method of liquidation. Thus the shorts and longs that prefer delivery would be matched insofar as such matching is
CASH SETTLEMENT

possible. All unmatched positions, plus all positions held by those who did not prefer delivery, would be liquidated by cash settlement. Those who preferred delivery but had to take a cash settlement, however, would receive a side payment from those who elected cash settlement.\textsuperscript{63}

The key factor in this scheme is to gear the side payment to some performance target that reflects some significant aspect of price behavior, quantity behavior, or both. Thus one could argue with some cogency for keeping cash and futures prices tracking one another, within some desired bounds, until contract maturity. This solution, however, requires fairly accurate readings of cash prices—a condition that might be unobtainable or might require substantial investment in price-reporting machinery.

In a variant of this approach, Kenneth Garbade and William Silber have argued for gearing the payment to the quality of the cash settlement index. If the index is likely to have large errors, the penalty payment should be large. This situation allows "the futures price to diverge from the settlement index, and avoids forcing price convergence to an inaccurate index. Moreover, this slippage permits arbitrage with the cash market to influence the futures price within the band created by the penalty."\textsuperscript{64} This approach assumes that there can be a reasonably objective assessment of the quality of the settlement index.

Alternatively, one could argue for keeping the rate of delivery on futures small but positive in view of knowledge that some producers and feedyard operators find that futures contract terms fit in with their normal merchandizing practices in respect to weight, quality, quantity, and location of deliveries. This solution assumes that reasonably good knowledge of this subset of the hedging interests is known to exchange officials. Moreover, it requires that the futures contract be more tightly drawn with respect to permissible delivery locations than it is now.\textsuperscript{65}

Another possibility is to use a mixed approach. Performance would be gauged and side-payments set to keep price behavior and quantity behavior within some reasonable bounds. The theoretical basis for this idea needs to be worked out more fully, however.

Regardless of which method of gearing side-payments to a performance target was used, the amount would be known in advance and would be reset periodically to reach that target. The economic gain would come from having installed a system that automatically draws more information about the quality of local cash price offers into the market. This information is generated by individual participants who decide whether to make or take delivery or to settle for
cash in view of the side-payment to be received or paid. Because the system would operate on a feedback basis, the quality of cash prices is likely to improve over time.

Special Problems of Economic Indicator Contracts

General Considerations. The important distinction between the proposed economic indicator contracts (new car sales, housing starts, manufacturers’ earnings) and other futures contracts is that the latter contracts facilitate speculation on changes in prices whereas the former facilitate speculation on changes in quantities. Thus, by definition, there cannot be a market in the item that enters into futures trading and, hence, there cannot be a way of tying the futures prices to cash prices through arbitrage. The futures price simply would arise from the market in bets that some event would or would not occur.

The business use of bets is to avoid large losses from an unfavorable event that occurs, like a sudden downturn in housing starts. While this is the general province of insurance underwriting, a sound insurance industry requires actuarial bases for taking bets. Futures trading in indicator contracts, were it to develop, would be a way for businessmen to lay off bets when an actuarial basis is lacking.

The assumption is that at a price that is not unattractive to businessmen enough speculators would take on the insurance function to make a futures market possible. Presumably, the rational speculator would take into account a large number of happenings since publication of the last indicator number and then estimate the direction and magnitude of the next indicator number. While rational speculators in commodity futures do the same thing, they have access to current cash prices as essential information. Speculators in indicator contracts only would have older numbers, making their task more difficult and less likely to succeed.

Evaluating the Accuracy of the Cash Settlement Number. Trading in indicator contracts would pose a special problem because there would be no ready way to judge the accuracy of the official number that is used to settle the outstanding contracts. Wrong numbers might have been entered into the index (inadvertently or otherwise), or the index might have been faultily constructed. A further consideration is that to maintain an image of reliability, the agency may delay making desirable changes in the index.

This is not the case with cash settlement of most futures contracts. Almost anyone could make his or her own evaluation of the cash
settlement price by using current cash price quotations that are widely available.

The Problem of Information Leakage. Because a time interval is needed to collate numbers from various sources, opportunities would exist for leakage of information about the probable number to be used in cash settlements. Curiously, this problem would not be confined to economic indicator contracts. It could arise in settling any broad-based price index for futures—like the CPI—in which it is difficult and costly to collect and interpret the same set of market prices that are used to construct the index. Hence, advance knowledge of the index number to be issued could be quite valuable.

One defense against leakage is to decentralize the information that determines the final number and then to collate the data as quickly as possible and guard the collation materials and the final number as well as possible. This procedure can become costly, and it is not foolproof, especially when all the relevant information becomes centralized in a computer.

If the information cannot be adequately secured against leakage at an acceptable cost, then consideration should be given to publishing the information but with caveats as to its preliminary nature. This procedure would erode the differential advantage from access to leaked information. Destroying this advantage might be one reason that more timely economic indicator statistics are now being issued on a preliminary basis.

Terminating futures trading in the indicator index for a time before the index number is released is another defense against leakage that is fairly costless and could be relatively effective. This delay would diminish the usefulness of the contract to many hedgers and pose the classical problem of evaluating the trade-off.

Finally, if the above solutions were not effective, then the incentive to leak information might be reduced by limiting the number of contracts that anyone, hedger or speculator, would be allowed to hold during the final days of trading in the futures contract.

Public Policy Issues

Most public policy issues raised by cash settlement contracts are little different from issues raised by conventional contracts. They concern mainly risk-shifting effectiveness, price stability, manipulation, pricing circularity, and the temporal structure of prices. Yet the issues should be examined afresh, especially where cash settlements have opened up futures trading to entirely new items.
Risk-Shifting Effectiveness. Risk-shifting effectiveness calls for close correspondence between futures prices and prices in cash markets. It requires accurate and rapid futures price adjustments in response to changing supply-and-demand conditions for an item. Achieving pricing accuracy depends on the cost and effectiveness of arbitrage. Cash settlements could raise or lower pricing accuracy depending on market conditions and on the design of cash settlements. The outcome may be largely self-determining. Businessmen shy away from markets in which the benefits do not exceed the costs. No obvious public action should be taken beyond the promotion of public understanding.

Price Stability. In theory, cash settlement contracts could either stabilize or destabilize cash prices. The trading history is too short for statistical testing. There already are some indications of problems, however. Several cases of a rapid price change during the final minutes of trading in stock index futures contracts and related markets have occurred, suggesting that even the broadest and best organized of cash markets may be destabilized by large-scale traders. These events suggest that the reading period for determining cash settlements is much too short and needs to be redesigned to lessen the effect of heavy trading on stock prices during the final minutes.

Studies of how futures trading has affected cash prices have dealt with conventional delivery contracts traded over long periods of time. In general, they show the effect of neutral or stabilizing influences rather than of destabilizing influences. The same conclusions probably would hold for cash settlement futures contracts after they have become fairly well established. Yet this conjecture may not be valid, suggesting the need for continued study of the matter.

A new question that might arise if futures trading in the CPI were to develop is whether such trading would have a moderating or accelerating effect on inflation. The resolution of this complex issue must take into account not only how traders are likely to react to the rate of change in the CPI but also how the government is likely to react in applying monetary and fiscal measures.

Manipulation. The futures exchange could limit the field for manipulation of cash settlement through the careful design of contracts. The limits are determined, however, by the economic environment of cash markets for the item and human ingenuity in adapting cash settlement techniques to each problem area.

The exchanges usually have rules and procedures that discourage manipulation. They have little or no jurisdiction over the behav-
ior of the cash market, however, except in the few cases in which an active cash market is conducted on the exchange. Hence, some larger authority would have to deal with manipulation of cash markets. A popular argument for government intervention is that the public, which participates in futures trading, needs to be protected against unfair trading practices. A broader argument is that manipulation of prices may adversely affect people who do not engage in futures trading, by raising their costs or lowering their incomes.

A critical assumption is that government somehow can prevent or mitigate the manipulation of cash prices that are used to determine cash settlements. Broad authorities to deal with manipulation are lodged with various government agencies—the CFTC, the SEC, the FTC, the USDA, and the Department of Justice. For the most part, these agencies deal under long, drawn-out proceedings with actions that are alleged to be manipulative after they have occurred. The prevention of manipulation would stem from whatever deterrent effects such activity would have on would-be manipulators.

More to the point, the CFTC systematically conducts market surveillance of trade positions during the delivery month to anticipate market squeezes before they become full-blown. Various emergency actions can be taken by the exchanges to contain adverse price effects, but with some possible market disruption. Effective use of such control machinery would be more difficult in the case of cash settlement contracts than in case of conventional contracts. The size of the deliverable supply would be harder to anticipate because under cash settlements the supplies that could affect cash prices during the reading period do not have to be certified.

Thus the main protection the public has against manipulation in the case of cash settlements rests with the use of contracts that are hard to manipulate. A possible role of government, then, is to identify those contract designs that, by some reasonable standards, do not pass this test and to discourage their use. (The Commodity Exchange Act of 1974 had given this role to the newly created CFTC.) The unsettled question is how well such identification can be made without an actual trial of the contract. A division of opinion on this question may lead to a division of opinion on whether a government agency should have the authority to disapprove contract terms before the contract has had a fair trial.

There appears to be no a priori way to settle this debate. The issue lies apart from the proposition that the government approval process is a means of gaining public acceptance of futures trading, which acceptance the exchanges may need as they venture onto unfamiliar terrain.
Judging from the great changes in the character of futures trading over the past ten years, the CFTC has not stifled innovation. Without CFTC controls, however, innovations might have proceeded more rapidly or at lesser cost. Because the exchanges compete with one another to develop new vehicles for futures trading and because trading in any one vehicle gravitates to the most active center, getting early government approval seems to be advantageous. Hence, from the standpoint of the individual exchange, the requirement of government approval is somewhat like a game of musical chairs.

Whatever one concludes about the balance of advantages and disadvantages of requiring prior government approval to trade in a new or revised contract, one should not conclude that conditions will not change. The stance of any government regulatory agency may shift with changing times and changes in staff. It may deteriorate as a source of constructive ideas on how to bridge the public and private interests in the design of futures contracts. At worse, it could stifle innovation.

If the exchanges were allowed to trade new futures contracts without the approval of a government agency, the public interest in preventing manipulation of cash settlement contracts should be honored by reducing the incentives to manipulate. The exchanges have various powers to do so, including surveillance and the imposition of penalties and position limits. Undoubtedly, the long-range interest of the futures trading industry is to control manipulation. The market, left to its own devices, eventually overcomes weaknesses in contract terms, as history suggests. But the process is slow and could create an image of callousness on the part of the futures-trading industry toward its public responsibility in seeing that the institution of futures trading is well run.

Another role for government is the fostering of workable cash settlement contracts, namely, the provision of better cash price information. Thus public assistance in developing useful cash settlement contracts, other than what is incidental to carrying out public regulatory activities, comes down to providing cash price quotations with which to make cash settlements—principally for agricultural products.

Such prices are now collected and disseminated as a public service, and anyone may use them. The main issue is whether the government should tailor its price reporting to fit better the needs of a futures contract that requires cash settlement. The issue probably comes down to sharing the additional expense of providing the needed price quotations. Such sharing of expenses would set no new precedent. The government already provides third-party inspection and
grading services on a fee basis to the commodity exchanges when deliveries on futures contracts are being made.

**Pricing Circularity.** The concern over pricing circularity is that cash settlement of futures contracts, if successful, may be accompanied by cash contracting based on futures prices. Thus cash prices could come to be images of the futures prices while futures prices are settled on the basis of cash prices. This circularity means that no mechanism causes prices to match true economic values. In other words, the hypothesis is that a successful cash settlement scheme for some commodities is likely to self-destruct.

It is not clear that a shift to formula pricing of cash commodities is more likely to occur when futures contracts call for cash settlement than when they call for physical delivery. The grain trade, for example, has shown a shift to formula pricing on futures quotations when futures contracts have called for physical delivery. The cash pricing system seems to work well. Thus the reasons for the shift in cash-pricing methods appear to be independent of the way futures contracts are liquidated.

Yet the concern is valid. If for any reason a shift to formula pricing of cash transactions occurs, when futures contracts call for cash settlements, the futures market could be undermined. The viability of futures trading would depend on how sensitively cash traders adjust their local cash–futures price differentials to changes in market conditions and on how well such adjustments are reflected by the price-reporting system. Cash settlement cannot eliminate the need for traders to make decisions about price and value. If traders avoid such decisions in the cash market, then cash settlement will not work. From a public policy standpoint, each case would have to be considered on its own merits before useful policy prescriptions could be advanced.

**Temporal Structure of Prices.** Economic theorists have attached great importance to the role of the forward market in coordinating individual economic decisions to reach equilibrium. Futures trading is first and foremost an instrument of the forward market. The interesting thing about cash settlements, however, is that their main direction of application, to date, has been to macroeconomic and not to microeconomic variables—that is, to trading in interest rates and stock price indexes and not to trading in individual commodities. (The development of active trading in the CPI would reinforce the case.)
Thus the temporal price structure for most current cash settlement futures has a different function from that of the temporal price structure for traditional futures. When an individual commodity is priced for forward delivery, the price spreads usually function as market-determined prices for providing services needed to turn spot commodities into the forward commodity. Hence the temporal price structure is an integral feature of the process of production, and it can be judged in this light. No such interpretation can be given to the temporal price structure (or lack of structure, as in the case of stock index futures) for macroeconomic variables. Their price spreads (or lack of price spreads) must be judged against a different set of theories.

The application of cash settlements to individual commodity futures with chronic delivery problems probably will be a slow process. Good cash price quotations are difficult and costly to develop. Nonetheless, large cash transactional systems are potential areas of application, possibly with the use of various optional cash settlement schemes already discussed.

**Retrospect.** Although cash settlement of futures contracts virtually burst upon the scene in 1982, it is part of a long chain of new trading arrangements that facilitate the assumption of forward positions in diverse assets. The consequences of cash settlements for the character and breadth of the items traded borders on the revolutionary, however.

With this development have been major changes in the character of the commodity exchanges themselves—changes geared much more to innovating, experimenting, and educating than before. In these respects the exchanges seem to have a momentum of their own. Public policy ought to provide scope and encouragement for working out the new possibilities for forward markets for any items of economic interest—be they commodities, services, financial claims, economic indicators, or simply events. The history of futures trading shows various surprises in what can be traded. Cash settlement possibilities add another facet to the grand experiment; they seem highly suitable for some futures and not suitable for others.

As much as anything, the requirements are a wider understanding of what forward markets can accomplish, imaginative thought on how information can be harnessed in the design of cash settlements to make more forward markets possible, and consideration of what sorts of protection of the public interest are feasible and desirable.
Notes


2. The time deposits in the Eurodollar market are not transferable, nor can they be withdrawn before maturity unless the depositor pays a fairly large penalty. These deposits contrast with Eurodollar certificates of deposit (CDs), which are bearer instruments and have a large secondary market. Yet, curiously, futures trading in Eurodollar deposits is based on time deposits and not on CDs because lending through the former has been many times greater than lending through the latter. There has been extensive tiering below the top two or three issues, and the discounts for the lower qualities have been quite variable. (Commodity Futures Trading Commission [CFTC], Division of Economic Analysis, *Memorandum*, December 2, 1981, pp. 11–12).

3. As a statistical term, an index number denotes a ratio between the value of some price, cost, quantity, or other dimension, taken at one period, and the value of the corresponding dimension taken at an earlier period—with the ratio multiplied by 100. To yield useful information, an index number for one item generally would be combined with like index numbers for other items in the same category to obtain an average for the entire set. This building-block construction allows the possibilities of trading in as many different futures as there are different indexes of economic interest.

4. These are the Baltic Exchange (BE) in London and the International Futures Exchange (INTEX) of Bermuda (see James A. Caron, *Ocean Freight Rate Futures Update* [Washington, D.C.: U.S. Department of Agriculture, Office of Transportation, May 1, 1985]). To overcome the heterogeneous nature of ocean shipping services—such as size of vessel, trade routing, or length of time charter—which makes the use of any one specification for par delivery too unrepresentative of other specifications to become a good hedging vehicle, a great many different specifications have been combined into an index. The main question at issue seems to be whether reasonably good cash price quotations with which to determine the cash settlements will be available on a regular basis. There appears to be little question that, if such problems could be solved, futures trading in ocean freight would aid business planning in a highly volatile market.

5. The New York Cotton Exchange (NYCE) has submitted a proposal to the CFTC to trade in an index of foreign currencies. This might turn out to be a convenient way to take positions in the value of the dollar without having to pick any one foreign currency, or gold, as the measure of value. While such a position could be taken now by dealing in separate forward
currency markets, either on or off the exchanges, trading an index of foreign currencies will reduce the "lumpiness" problem.

6. The usual argument that proponents of futures trading have offered to substantiate its legitimacy is that futures contracts always require delivery if either party so desires. The intent to deliver became the main criterion of the courts in distinguishing between legitimate business contracts and gambling contracts. (Holbrook Working "Economic Functions of Futures Markets," in Futures Trading in Livestock [Madison, Minn., 1970], pp. 18-22.) It took much time for the more persuasive evidence to accumulate, namely, that many commodity firms use future trading, either directly or indirectly, in the everyday conduct of their businesses even though most or all of their futures contracts are liquidated by entering offsetting positions before they are due. If the legitimacy of futures trading is accepted on these grounds, then the use of cash settlements in lieu of delivery should not upset the reasoning.


A quasi cash settlement seems to have been practiced in England toward the end of the last century and into this century. According to Holbrook Working and Sidney Hoos, "Wheat Futures Prices and Trading at Liverpool Since 1886," Wheat Studies of the Food Research Institute (November 1938). The Liverpool exchange did not require delivery on its imported wheat contract. Yet they observed that it never had a detectable aberration of prices during the delivery period. The value of the contract not closed out by offset or delivery was determined by arbitration. The cash settlement was based on the price of wheat at the end of the delivery period as determined by an exchange committee. While virtually all commodity exchanges deal with defaults in this way, the Liverpool exchange seemed to regard failure to offset as something that could be accepted without prejudice.

A partial cash settlement has always been embedded in the U.S. cotton contract. If the shorts elect to deliver a lesser quality than the par grade,
they must compensate the longs with payment equal to the cash market price differential between the par grade and the delivered grade, as observed by a committee on a designated day prior to delivery. Thus, unlike most contracts that provide for fixed differentials for substitute delivery, the cotton contract requires a reading of the cash market near each delivery time. Thus special machinery must be set up to obtain a credible reading of cash prices for different grades of cotton, very much as if the entire contract were liquidated by cash settlement. While the cash settlement for substitute grades usually constitutes but a small fraction of the contract's market value, it is a significant sum to cotton spinners and merchants who operate on narrow margins. (Alonzo B. Cox, *Cotton Prices and Markets*, Bulletin 1444 [Washington, D.C.: U.S. Department of Agriculture, December 1926].)

Amsterdam developed sophisticated institutions of finance and trade during the seventeenth century, including futures trading and option trading. Historical accounts, however, do not clarify whether any of these contracts called for cash settlements. (Violet Barbour, *Capitalism in Amsterdam in the 17th Century* [Ann Arbor: University of Michigan Press, 1976]), pp. 74–84.

11. A spokesman for one large user of broilers had observed at the time that "USDA market reporters may not report a discounted cash load as quickly as a higher priced load when the market is going up. In other words, you make the case that cash broker prices have a 'positive bias.' I don't have any research data to back that statement up, but it does seem that way to us at times" (Marvin L. Hayenga, ed., *Pricing Problems in the Food Industry Monograph 7*, North Central Regional Project 117 [Madison: University of Wisconsin, February 1979]), p. 48.


14. Ibid.


16. It may seem puzzling that housing starts have no market whereas houses do. The day people can buy and sell the former, the distinction will disappear.

17. This definition of arbitrage is given in the CFTC *Annual Report* for 1983 (p. 155). Spreads are defined there as "the purchase of one futures delivery month against the sale of another futures delivery month of the same commodity, the purchase of one delivery month of one commodity against the sale of that same delivery month of a different commodity, or the purchase of one commodity in one market against the sale of that commodity in another market, to take advantage of and profit from a change in price relationships" (p. 175).

A switch is defined as "offsetting a position in one delivery month of a commodity and simultaneous initiation of a similar position in another deliv-
ery month of the same commodity. When used by hedgers, this tactic is referred to as ‘rolling forward’ the hedge’’ (p. 176).

Placing a conventional hedge in a futures contract near its time of delivery is a form of arbitrage (in its broad sense) because uncertainties about output are largely gone and thus there is little risk in completing the arbitrage by delivering the commodity.

18. For a recent discussion of arbitrage and spreading operations see FRB, CFTC, and SEC, A Study, chap. 2.

19. These costs may include forgone interest on margin deposits; taxes; uncertainty of outcome; and the like.

20. It is not clear what factors would determine the relationship between spot and futures prices in the case of a truly perishable commodity (such as ocean freight) except for different expectations about demand and supply in the future compared with the present. Relatively perishable items, such as iced broilers, traded on futures usually have a storage state (frozen broilers) that encourages arbitrage in the fresh product much as if it were storable in its own right.

21. “Convenience yield” refers to the benefit from holding commodity stocks in reserve to ensure continuity of the firm’s processing or merchandising operations.

22. Futures contracts requiring cash settlement necessarily fall into the first group, whether the contracts are for financial instruments or for physical commodities.

23. In the early development of futures trading, contracts that gave the buyer the discretion of when to receive delivery were traded alongside those that gave the seller this discretion. Evidently, the former contracts were not as popular as the latter and ultimately fell into disuse. See Charles H. Taylor, History of the Board of Trade of the City of Chicago, vol. 2 (Chicago: Robert O. Law Co. 1917), pp. 897-98.

24. The hedge simply becomes a provisional sale of the commodity until the actual sale of the cash item can be arranged. The hedge no longer is an indirect way of marketing storage services.

25. Delivering only after trading in a contract has ended deprives the market of redeliveries; in many markets, redeliveries are an efficient means to liquidate a large number of contracts during the delivery month. Moreover, the bunching of deliveries after trading stops may create logistical problems in supplying the commodity.


28. For a fuller treatment of the topic of market squeezes see Allen B.
29. The primary depositors and ultimate borrowers of Eurodollars are not banks but individuals, business firms, government entities, and international organizations. Banks receiving Eurodollar deposits may have no immediate need for them, however, and may offer the funds to other banks, via the interbank market, for stipulated periods usually not exceeding six months. Roughly one-half of the gross Eurodollar deposits appears to be the result of interbank lending (CFTC, Memorandum, December 2, 1981, pp. 12–13).

30. The original proposal submitted by the CME to the CFTC in April 1980 provided for the physical delivery of Eurodollar time deposits and CDs. Concerns over the possibility of affecting physical delivery of Eurodollar deposits caused an amendment to the proposal resulting in the current contract design. (CFTC, Memorandum, December 2, 1981, p. 6).


32. In fact, the first application, submitted by the Kansas City Board of Trade (KCBT) in 1977 was to trade a 30 Industrial Stock Index futures contract that would give the seller a choice of liquidating by delivery or by cash settlement. After public comment and public hearing on the proposal (CFTC, Hearing, October 25–26, 1978), the idea of permitting delivery was dropped. Following this, the KCBT adopted the Value Line Index of some 1,700 stocks, the New York Futures Exchange (NYFE) adopted the New York Stock Exchange Index of some 1,500 stocks and the CME adopted the Standard & Poor’s index of 500 stocks. With so many stock issues in each index, the liquidation of contracts by delivery of certificates is unthinkable.

The high cost of delivering certificates might be circumvented by setting up a special index fund the portfolio of which is exactly the same as the composition of the index in which futures contracts are traded. Then deliveries on futures would simply be made by tendering shares in the index funds that have been approved by the exchange. Such funds should not be closed-ended to avoid discounts or premiums on their shares from net asset values; and the problems and costs of ensuring that the fund has the requisite shares on inventory to back the claims issued would have to be relatively modest.

33. Conceivably, the delivery problem could have been circumvented by trading in Eurodollar CDs instead of Eurodollar time deposits, except that the cash market in the latter is large and the cash market in the former is not. In any case, variation in credit risks among banks issuing CDs might have dissuaded traders from taking long positions lest they receive the lesser qualities of CDs. Hence CD contracts in Eurodollars might have failed on this count just as futures contracts in commercial paper of U.S. corporations failed. The cash settlement contract serves to price an average of the credit risks in Eurodollar loans among prime London banks.

34. Specifically, twelve banks are randomly selected from a panel of twenty prime London banks, and each is asked to report its perception of the market within the last ninety minutes of trading on the last day, as well as its
perception of the closing price. The two highest and two lowest prices for the randomly selected time, and for the closing time, are ignored; the remaining eight prices for each time are averaged, and the cash settlement price becomes the average of the two averages. (CFTC, Memorandum, December 2, 1981.)

35. Such comparisons are not possible beyond the September 1984 maturity because of the coincidence of termination dates.

36. One check on the existence of these price distortions at the close of trading in the selected Standard & Poor's futures contracts is to ignore the NYSE contracts and simply to compute the relation of each Standard & Poor's futures contract to the Standard & Poor's index at the close of trading on the stock exchange. Theoretically, the price for a deferred maturity should exceed the price for a current maturity by the current interest yield to maturity on the present value of the index minus the expected dividend receipts. While a change in interest rates could cause the spot-futures price spread for the index to change from day to day, it seems more than a curiosity that the spread widened in each of the cases, resulting in increases in the spread of 0.66, 0.32, and 0.36 percentage points for the June, March, and December contracts, respectively—about the same sort of results obtained by the other method.

37. Kerwin, "Is the Tail Wagging the Dog?"

38. For example, according to a recent government study, some institutional users of stock index futures need to have an efficient way to rebalance portfolio assets involving cash, long-term debt, and stock, in line with changes in their preferences. (FRB, CFTC, and SEC, A Study, pp. IV–21.) Presumably, these interests would be less sensitive to adverse effects of broadening the reading period than broker-dealers would be in positioning their inventories.

39. Subsequently, the proposal was amended to provide five industry indexes each containing ten stocks—a way of broadening the indexes yet making them somewhat less precise representations of the industries.

40. Conceivably the longs should discount the prospect of getting inferior goods on delivery and have no great surprises; but the futures markets seem to do such discounting imperfectly in good part because information about the quality of prospective deliveries is imperfect.

41. For example, a municipal bond index contract proposed by the CBT includes a plan to replace twice each month the oldest bond issues or those in default, having a rating change, or otherwise not meeting designated criteria with new issues that do meet such criteria (Chicago Board of Trade's Municipal Bond Futures Contract, Chicago, March 5, 1984, pp. 1–3). This feature, of course, does not address issues that arise in respect to the reading of the cash prices of any of the issues in the index.

43. The recent government agencies' study concluded that

To date, there have been no known manipulations via corners or squeezes of financial futures contracts requiring physical delivery. Allegations of squeezes in the CME's three-month Treasury bill futures contract were made during 1979 and 1980, when deliveries against this contract were high relative to the supply of deliverable Treasury bills; however, evidence relative to cash and futures Treasury bill positions failed to corroborate these allegations. (FRB, CFTC, and SEC, *A Study*, pp. VII-5 and 6).

44. That the delivery rate is high is generally accepted, but interpreting statistical evidence is problematic. For example, annual deliveries on foreign currency futures as a percentage of the annual volume of trade in such futures has been no higher than average for all other futures trading. Yet deliveries of foreign currencies on futures contracts as a percentage of the contracts that are open at the beginning of the delivery month has been well over twice the average rate (see table 5-5). The discrepancy arises because in foreign currency futures markets the intraday trading volume is relatively large.

### TABLE 5–5

**Rate of Contract Liquidation by Physical Delivery or Cash Settlement by Contract Category, 1983–1984**

<table>
<thead>
<tr>
<th>Contract Category</th>
<th>Number of Contracts</th>
<th>Deliveries or Cash Settlements as a Percentage of Volume of trade (%)</th>
<th>Open contracts at beginning of delivery month (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural commodities</td>
<td>18</td>
<td>0.4</td>
<td>7.6</td>
</tr>
<tr>
<td>Industrial commodities</td>
<td>5</td>
<td>0.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Precious metals</td>
<td>5</td>
<td>1.5</td>
<td>6.6</td>
</tr>
<tr>
<td>Debt claims</td>
<td>5</td>
<td>0.2</td>
<td>8.5</td>
</tr>
<tr>
<td>Foreign currencies</td>
<td>5</td>
<td>0.9</td>
<td>20.4</td>
</tr>
<tr>
<td>Median</td>
<td></td>
<td>1.1</td>
<td>7.2</td>
</tr>
<tr>
<td>Cash settlement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock indexes</td>
<td>3</td>
<td>0.4</td>
<td>18.4</td>
</tr>
<tr>
<td>Debt claims</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Median</td>
<td></td>
<td>0.4</td>
<td>15.6</td>
</tr>
</tbody>
</table>

**Sources:** Based on data in the CFTC Annual Report, 1984 and various issues of *The Wall Street Journal.*
45. Calculations based on month-end open positions for October, January, April, and July contracts during the October 1982 to July 1984 period show, on average, the following percentages of open positions that were held in the nearby contract on a day a month or two before the contract matured: Standard & Poor’s 500 stock index, 90; Value Line index, 87; NYSE Composite index, 77. The corresponding percentages for conventional delivery contracts in debt issues were: Bank CDs, 53; Treasury bills, 56; Treasury bonds, 57; and Government National Mortgage Association (GNMA) mortgage-backed certificates, 51. Interestingly, the percentage for Eurodollar deposits, which is a cash settlement contract, is only 41.


47. Conceivably, another way would be for the Treasury to issue bonds the face value of which was geared to changes in the CPI.

48. CFTC, Memorandum (April 9, 1985). The ocean freight rate index, mentioned previously is of the same genre but is more specialized.

49. CFTC, Memorandum (April 9, 1985), pp. 17–23.

50. At times minicontracts have been traded on the same exchange as standard-sized contracts. For example, before World War II, trading in “odd lots” of 1,000 bushels per contract for wheat were conducted by special brokers in the same pit on the CBT as the trading in the standard 5,000 bushel contract.

51. Delivery is made with a shipping certificate, which allows the long to choose a destination for the shipment of the soybean meal.


53. One complication, for example, is that arbitrage between the price for the minicontract and the regular contract becomes excessively costly whenever hogs on two minicontracts are received at two different delivery points while delivery on the regular contract must be made at a single delivery point.

54. Frozen concentrated orange juice is mostly consumed in the same establishment where produced. Cash trading in the fifty-five gallon drum of super concentrated orange juice—the futures contract unit—is done chiefly among processors on an intermittent basis to even up their individual inventories of different qualities for blending purposes.

55. Allen B. Paul, Kandice H. Kahl, and William G. Tomek, Performance of Futures Markets: The Case of Potatoes (Tech. Bull. No. 1636, USDA, January 1981), chaps. 2, 5, and 6. On average, one out of every five cars tendered on the May contract during 1973–1978 was rejected. The failure rate on the March and April contracts was almost as high. Moreover this rate varied widely from year to year creating much uncertainty. When the failure rate rose to 86 percent in March 1979, further trading in the contracts was suspended.

56. Details of this fairly complex formula are given in CFTC, Memorandum (June 14, 1983), pp. 20–31.

57. Unpublished studies made by the CME.
58. The existence of proprietary interests in contract terms is a general problem in attempts to change the terms. Thus from time to time the arguments advanced for omitting or adding a particular delivery point, or mode of delivery, to a futures contract have been underlain by rival economic interests. The point of contention could be the services of particular port facilities, railroads, warehouses, or stockyards. A clear example was revealed upon the large default on the Maine potato futures contract in 1976. The only mode of transport permitted on futures delivery until then was by railroad even though the truck had long ago supplanted the rail car as the principal mode of moving potatoes from Maine to New York City.

59. Frank J. Jones "The Economics of Futures and Option Contracts Based on Cash Settlements," *The Journal of Futures Markets*, vol. 2, no. 1 (Spring 1982), appears to make this a central argument in favor of cash settlements under difficult delivery conditions:

As the differences between cash market prices of the various deliverable grades vary and different deliverable grades become the cheapest deliverable, the spread between the futures price and the price of any particular deliverable will vary . . . much of this basis risk can be eliminated with cash settlement. By specifying a cash market price index which represents an average of the various deliverable grades (to obtain an adequate deliverable supply) the futures contract prices off, not the cheapest deliverable grade, but the average deliverable grade. Since the average price changes by less than the price of the cheapest deliverable due to the shifting among the various cheapest deliverable grades, cash settlement will reduce the basis risk in a futures contract under such circumstances. (p. 72)

60. Thus a cash settlement contract for corn, based on prices paid to farmers by country elevators, might fit the needs of commercial growers, country elevators, feedlot operators, and local processors as well as other businesses. Unless average price changes at the country level were well correlated with average price changes at higher levels in the marketing chain, such a cash settlement contract might not be as suitable to grain merchants as the existing contract.

61. Anyone who buys a put (the right but not the obligation to sell stock to another party at a fixed price) while selling a call on the same stock at the current market price would, in effect, have a short position in a futures contract for that stock at that price (assuming that the premium paid for the put and the premium received for the call cancelled). Similarly, anyone who buys a call and sells a put in the stock at the market price has the equivalent of a long position in a futures contract for the stock at that price. Option contracts can be exercised by delivery of the stock.

62. The liquidation of very broad stock index futures by cash settlements set a precedent for cash settlements of subsequent stock index contracts that were, in turn, progressively less broad. That is, the CFTC gave initial approval in 1982 to the Value Line index with its nearly 1,700 stocks. It gave its latest
approval to stock indexes in the AMEX Major Market Index with its 20 stocks in 1984.

63. It is not immediately clear whether the side payment should be made only by part or by all of the traders who elected cash settlement on the side of the market needed to balance off those who preferred delivery and could not get their wish. The answer may be pragmatic, turning on how the levy affects participation in the market (Paul, Kahl, and Tomek, Performance of Futures Markets, pp. 118–31).


If the index is prone to error, a large penalty imposed on those choosing cash settlement will encourage physical delivery, thereby loosening the linkage between futures prices and the inaccurate index. If the index is quite accurate, a small penalty should be imposed so that futures prices converge more closely to the index.

65. The idea of using a quantitative target was set forth for dealing with fairly intractable problems in the storage potato industry (Paul, Kahl, Tomek, Performance of Futures Markets, pp. 118–31).

The feeder cattle market probably would lend itself even better to cash settlement methods than the potato market would. The feedback mechanism for feeder cattle would have a better opportunity to do its work. The spacing of contract maturities every sixty days through the entire year would provide more opportunities to adjust the side payments to changing conditions.

66. This device is used in the recently approved futures contract in the CPI. Trading is to be terminated two business days before the official release date.


68. For a general introduction to this subject see Recommended Policies on the Cash Market Regulatory Authority and Cash Market Data Needs of the Commodity Futures Trading Commission, Report of the Advisory Committee on Definition and Regulation of Market Instruments to the Commodity Futures Trading Commission, October 1976.


69. In the case of futures trading in government securities and government indexes, the approval process would seem to have more at stake than merely gaining public acceptance.

70. For example, see John R. Hicks, Value and Capital, 2d ed. (London: