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FUTURES TRADING AND HEDGING

By HOLBROOK WORKING*

A good deal of difference of opinion on the utility of futures trading persists even among economists who have studied the subject rather closely. Some, at least, of this disagreement is traceable to imperfect concepts that emerged in connection with early academic studies of futures trading. Such concepts have tended to survive on the strength of their partial validity, despite shortcomings evident to the well-informed. Businessmen and others who are intimately acquainted with futures trading and its consequences tend to realize (often unconsciously) the defects of such imperfect concepts, to employ the concepts so far as they are valid and useful, and to avoid drawing any seriously mistaken conclusions from them. People who have little direct knowledge of futures trading and its observable results have no such protection against false inferences. If, like most economists, they are accustomed to rely on deductions from what seem to be well-established premises, they are especially vulnerable to the imperfections of basic concepts.

I. Origin and Nature of Futures Trading

Much of the popular suspicion of futures trading stems from a sense of mystery associated with it. It is in this respect, and some others, rather like bank credit. Futures trading, like banking, is an institution that developed as a contribution to efficiency of a relatively free competitive economy. A primitive form of futures trading emerged spontaneously in various market centers at least as early as 1850. Only in the grain trade at Chicago, however, was the demand for a means of hedging commercial risks then strong and persistent enough to permit this unconventional form of trade to survive the fluctuations in speculative interest, overcome conservative opposition, and live through the stormy period of experimentation necessary to put it on a firm footing. When that had been accomplished at Chicago, the new form of

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trading was soon adopted at other market centers and for other commodities than grains.¹

Futures trading in commodities may be defined as *trading conducted under special regulations and conventions, more restrictive than those applied to any other class of commodity transactions, which serve primarily to facilitate hedging and speculation by promoting exceptional convenience and economy of the transactions.*

This may seem to some an inadequate definition. It does not say that futures trading is buying and selling for deferred delivery; it draws only a slender line of distinction between futures transactions and "cash" transactions (dealings in the "actual commodity"); and it makes the distinction between futures trading and other sorts of trading turn primarily on *purpose* rather than on more easily and objectively recognizable criteria. All of these characteristics are in fact merits of the definition.

It would be inaccurate to define futures trading as always involving purchase and sale for deferred delivery. Trading in the September wheat future, for example, is done in the month of September as well as in earlier months, and in that month it often happens that some sellers of September wheat intend to make immediate delivery, and the purchaser knows that he may expect to receive immediate delivery. The price of the future is then in fact a spot price. One might, of course, qualify the statement by saying that *most* futures trading is for deferred delivery. The statement would then be true, but objectionable in a definition because it would focus attention on a characteristic (deferred delivery) that has little distinguishing value. A great deal of buying and selling that is *not* futures trading involves delivery at some later time. In international commodity trade in staples, purchases calling for delivery two or three months or more in the future are commonplace, quite apart from true futures trading, and independently of whether or not futures trading exists in the commodity. Much of the trade in manufactured products as diverse as flour, steel rails, and machine tools (none of which has futures trading) involves purchase on contracts entered into several months in advance of the specified delivery date; in the case of machine tools, the interval may sometimes

¹This, in two sentences, is the story that can be read from scattered comments in Charles H. Taylor, *History of the Board of Trade of the City of Chicago* (Chicago, 1917). Passages in Vol. I, pp. 146-47, 192, 217, 317 and 332, among others, cover the main developments through 1865, when the Board of Trade at last assumed responsibility for aiding and governing the conduct of futures trading.

H. C. Emery, in *Speculation on the Stock and Produce Exchanges of the United States* (New York, 1896) traces the history of trading that had at least some essential characteristics of that done in futures, from institution of the use of warrants by the East India Company in 1733 (p. 35), and says that "Futures were sold in some kinds of grain in Berlin by 1832, and some years earlier in France and Holland" (footnote, p. 41).

be measured in years. Because the people who turn for enlightenment to a definition of futures trading are often unaware of the wide prevalence of forward purchases (except in retail trade), the characterization "usually for deferred delivery" would fail to be generally recognized as only slightly narrowing the area of reference, and would divert attention from more sharply distinguishing characteristics.

The definition given above does in fact distinguish clearly between futures transactions and other transactions—so clearly that there need never be any problem of identification except in such cases as appeared when futures trading was taking its first steps in evolution from other trading and was not yet clearly differentiated. The definition lacks sharpness only in the sense that it does not make futures trading appear very different from other trading. That is a merit, because futures trading in fact has no distinguishing economic characteristics except those stated in the definition, or resulting from them (such as exceptional volume of trading, frequency of transactions, and publicity of quotations).

If a reader feels that the foregoing definition does not distinguish strongly enough between futures trading and other trading in commodities, it may be either because he underestimates the remarkable convenience and economy which are the primary distinguishing characteristics of futures trading, or because he mistakenly believes it to have peculiar characteristics that it does not have. Its extraordinary economy is illustrated by data cited below, in another connection, indicating that a trader in cotton futures could make a very satisfactory net income on the basis of a *gross* profit margin of about 23 cents per thousand dollars worth of transactions—a gross profit of one-fortieth of one per cent.

Mistaken impressions of the difference between futures trading and other trading have been furthered by a language difficulty that arises in connection with the frequent need to speak collectively of all-other sorts of trading, as against futures trading. There is no good and convenient word for the purpose—and perhaps there cannot be, simply because the need is to designate all of a heterogeneous category except one special, narrow segment of it. "Nonfutures" would be an accurate and transparent term for the purpose, but an awkward one. In this situation, convenience has been served most commonly by using the word "cash" to mean "nonfutures." The practice probably originated in the Chicago grain trade, contemporaneously with the origin of sustained futures trading. Its application involved two shifts of meaning: (1) use of "cash" to designate, not immediate *payment*, as is usual, but immediate *delivery*; and (2) extension of the altered meaning to cover all terms of delivery except those involved in futures contracts. These

changes left the word with no logical merit for the purpose except its brevity. In the cotton trade, the common word for "nonfutures" is "spot." This is inherently more confusing than use of the term "cash," because "spot" continues to be used in the trade also in its specific sense of "immediate delivery"; but the grain trade has lost such potential relative advantage of clarity as it might have had, by using "cash" also as equivalent to "spot" in the sense of "immediate delivery."² Most seriously misleading is the frequent resort to use of "actual" to mean "nonfutures," as when purchases on terms other than those of futures contracts are distinguished as purchases of the "actual commodity." That expression is used to *include* forward purchases other than on futures contracts, even though all forward purchases are alike in the fact that there is no acquisition of the actual commodity at the time of purchase.³ Like the other expressions used for the same purpose, it is a verbal expedient only vaguely defensible in terms of the normal meaning of the expression. Futures contracts involve transactions in the actual commodity as truly as do any other forward transactions.

As regards failure of the definition to give easily and objectively recognizable criteria for identifying futures trading, it should be noted that there is no practical problem of identification except in cases of primitive futures trading, and in such cases purpose is the only available criterion;⁴ otherwise, futures trading has always gone under that name, or the equivalent in another language. The definition should indicate the essential distinguishing nature of futures trading, and that is not done by mere listing of superficial technical characteristics, specified in regulations intended to promote convenience and economy. Reliance on these superficial characteristics for definition encounters also the difficulty that they have varied widely from time to time and from place to place. Consequently, definitions based on such characteristics show an historical trend toward increasing complexity and obscurity as later writers tried to remedy technical shortcomings found in earlier definitions.⁵

²This is not to say that anybody in either the cotton or the grain trade is confused by these practices any more than initiates are confused by the colloquial uses of "buck," "date," and "doll" (all words with the same brevity as "cash" and "spot"); but the usage is a bit frustrating, and even misleading, to an inquiring novice.

³Whether use of the expression has its foundation directly in this characteristic, or in the related fact that *speculators* use futures contracts, as they may any forward contracts, to avoid necessity for *handling* of the actual commodity, is a matter of surmise.

⁴The characteristics of convenience and economy being at that stage not well developed.

⁵See, for example, the evolution of definitions from H. C. Emery, *op. cit.*, p. 46, through J. G. Smith, *Organized Produce Markets* (London, 1922), p. 44; C. O. Hardy, *Risk and Risk Bearing* (Chicago, 1923), pp. 205-06; J. B. Baer and O. G. Saxon, *Commodity Exchanges and Futures Trading* (New York, 1949), pp. 132-34.

II. *Hedging as a Basis for Futures Trading*

An interesting conflict of evidence has emerged regarding the comparative rôles of speculation and hedging in sustaining futures trading. Most of the available information prior to about 1920 encourages the view that futures trading rests primarily on an urge for speculation. Hedging is rarely mentioned except in arguments justifying the continuation of futures trading. One gains the impression that hedging, like a hitchhiker, seized the chance for a ride since speculation presented the opportunity. But as statistics have been accumulated that give appropriate quantitative information on futures markets, year in and year out, hedging begins to look like the driver, and speculation in futures like a companion going where hedging gives it opportunity to go.

The first conspicuous evidence in this direction came in studies of the Grain Futures Administration (predecessor of the present Commodity Exchange Authority) that showed the volume of open (outstanding) futures contracts in each commodity rising and falling each year in rough correspondence with the volume of the commodity in commercial hands and likely to be hedged.⁶ Speculators tend to be most heavily committed in futures, not during the growing season of a crop, when prices are most variable, but some time after harvest, when large stocks have moved into commercial storage and been hedged.

As between commodities, the volume of open contracts varies likewise with the amount of the commodity that is hedged. The volume of open contracts in wheat futures in the United States during recent years has averaged about 90 million bushels, while the volume in corn futures has averaged not much over 50 million, though corn has been produced in nearly three times the volume of wheat. The reason is that much less corn than wheat gets into commercial hands (farmers rarely or never hedge the stocks that they hold). Oats, produced in volume less than half that of corn and, like corn, stored mainly on farms, has had an average volume of open futures contracts less than half that of corn.⁷ So one may go through the list of commodities in which there is futures trading and find, wherever there is information on the amount of hedging use of futures markets, an unmistakable connection between size of the futures market and the amount of hedging that the market is called on to carry.⁸

⁶ See, for example, the summary of much earlier work in G. Wright Hoffman, *Grain Prices and the Futures Market*, U. S. Dept. Agric., Tech. Bull. No. 747, January 1941, pp. 33-38.

⁷ Data are conveniently available in *Agricultural Statistics* (Washington) for any recent year.

⁸ Size of a futures market is better judged by volume of open contracts than by volume of trading because of the wide variation between markets in proportion of trading con-

Though the amount of speculation on a futures market seems to depend so much on the volume of hedging, there is also a connection in the other direction. As between different exchanges dealing in the same commodity, there is a strong tendency for hedgers to prefer to use the exchange which has the largest volume of speculative trading. We shall examine the reason for this later. As regards commodities, it may be observed that in some the volume of hedging has, at times at least, been restricted by absence of sufficient speculative interest to carry the hedges.⁹ In the United States, no futures market for a commodity which is chiefly imported, has flourished like the markets for the more important domestically produced commodities. This may be not entirely because the imported commodities give less occasion for hedging, but partly because there are relatively few people in the United States who have acquired an interest in those commodities sufficient to inspire speculation in them.

When one reviews evidence on the earlier history of futures trading, making allowance for the tendency for sporadic news and comment to concentrate on the unusual, and for exceptional outbursts of speculation to draw special attention, one can find reason to think that a desire for hedging opportunities may have always provided the primary support for futures trading. It seems reasonable to suppose that a primitive form of futures trading in grains was able to survive and develop to maturity in Chicago in the middle of the last century, whereas similar trading tried somewhat earlier in Europe was abandoned, because there was much more occasion for hedging the large stocks of grain that came into commercial hands in the Chicago area than for hedging the much smaller stocks of European markets. It seems quite clear that the first successful futures trading in wheat in Great Britain was based on contracts for Californian wheat because that was the wheat which importers found most need to hedge, on account of the long periods over which importers held ownership while the wheat travelled by sailing vessel around Cape Horn to Britain.¹⁰

One can imagine existence of futures trading purely on the basis

tributed by "scalping" and by other trading that involves holding a commitment for only a few minutes or hours, with correspondingly small speculative risk and small economic significance.

⁹ For example, such an inference seems to follow from information in Blair Stewart, *Trading in Wool Top Futures*, U. S. Dept. Agric., Circ. No. 604, August 1941, pp. 16-26.

¹⁰ See Holbrook Working and Sidney Hoos, "Wheat Futures Prices and Trading at Liverpool since 1886," *Wheat Studies of the Food Research Institute* (Nov. 1938), XV, 125, 142-44. I would now attach less importance than is done there to the uniformity of the quality of the Californian wheat, judging that factor to have been important mainly in the preference for the Californian over the Indian wheat contracts, in which also there was effort for a time to maintain futures trading.

of desire of people to speculate; but apparently futures trading cannot long persist except on the basis of conditions that create speculative risks which somebody must carry, and which some people are led to transfer to others by hedging. The reasons for choosing thus to transfer risks deserve our attention next.

III. *Misapprehensions about Hedging*

It is common to suppose that hedgers exercise no part in determining the price of the commodity in which they deal, and this supposition is substantially valid as regards those who practice hedging uniformly.¹¹ But most hedgers are engaged in a business that requires them to keep informed on many aspects of the commodity situation, with the result that many hedgers often form quite definite opinions on price prospects. Except in firms that have a strict rule against taking hedgable risks, it is common, therefore, for stocks to be carried unhedged at times, when the responsible individual expects a price advance, and for stocks of the commodity to be hedged at other times. Some individuals and firms hedge stocks only when they are particularly fearful of price decline.

Such discretionary hedging, involving a firm in the practice of both hedging and speculation, seems to be especially prevalent among dealers and processors who handle commodities such as wool and coffee, that have relatively little public speculation in their futures markets.¹² When hedge selling in such a futures market becomes heavy, the price may readily be depressed to a point where a good many dealers and processors are attracted by the possibilities of profit through speculative holding of the commodity. Even among handlers of commodities which attract broad public participation to their futures markets, such as wheat, discretionary hedging is not uncommon.¹³ Consequently the existence of futures trading in a commodity and widespread use of futures for hedging do not in fact mean that the responsibilities of price formation are shifted entirely, or even mainly, to people who deal only in the commodity futures.

A major source of mistaken notions of hedging is the conventional practice of illustrating hedging with a hypothetical example in which

¹¹ Not entirely valid because hedgers are the active agents in determining the *relation* of spot to futures prices, and to that extent they play a major rôle in formation of the spot price.

¹² The case of wool has been documented (*cf.* Blair Stewart, *op. cit.*); the inference that similar situations exist in certain other commodities is based on fairly reliable trade reports.

¹³ Cf. the Federal Trade Commission's *Report on the Grain Trade* (Washington), Vol. I (1920), pp. 213-27; and Vol. VII (1926), pp. 38-57; and Holbrook Working, "Financial Results of Speculative Holding of Wheat," *Wheat Studies* (July 1931), VII, 417-28.

the price of the future bought or sold as a hedge is supposed to rise or fall by the same amount that the spot price rises or falls. Let us instead consider hedging realistically in terms of some actual prices. The prices to be used will be those for wheat at Kansas City on the first trading day of each month in which futures matured during the crop-year 1951-52.¹⁴

On the first business day of July 1951, a merchant or processor¹⁵ considering the purchase of the cheapest quality No. 2 Hard Winter wheat (the quality represented by quotations on Kansas City wheat futures) found such spot wheat selling at 3 cents per bushel under the price of the September future. If he bought spot wheat, hedged it in the September future, and carried the wheat until the first business day of September, the results, in cents per bushel, would have been as shown below:

Quotation	Date and Price July 2	Date and Price Sept. 4	Gain or Loss
Spot No. 2 Hard (low) September future	229 $\frac{1}{4}$ 232 $\frac{1}{4}$	232 $\frac{1}{2}$ 233 $\frac{1}{2}$
Spot premium	-3	-1	+2 (gain)

The profit of 2 cents per bushel is calculated above, in what may seem an awkward way, from the change in spot premium (a negative premium, or discount, on each of these dates). It is awkward, however, only for those to whom it is unfamiliar. The hedger tends to calculate his profits in this way because he would buy the wheat on July 2 primarily for the reason that he could get it at discount of 3 cents per bushel under the price of the September future. In fact, the bargaining which preceded the purchase would normally proceed in terms of discount rather than of price, the price being ascertained by reference to the latest futures price quotation, after sale at a mutually satisfactory discount had been agreed on.¹⁶

¹⁴ Kansas City is used rather than Chicago because changes in the major wheat-producing areas and in the normal lines of movement of the commodity have left Chicago with a vestigial spot wheat market that no longer affords a good source of spot price quotations.

¹⁵ The case of a merchant or processor deserves to be considered rather than that of someone not in such a business, who might buy merely for storage, because merchants and processors gain auxiliary benefits from having stocks on hand that give them a competitive advantage in storing. Their competition for the returns available from storage leaves little opportunity for profitable storing as an independent enterprise.

¹⁶ This is the normal procedure in connection with spot sales of wheat at Kansas City and at other markets with active futures trading. The actual bargaining on July 2, however, would have been in terms of premium or discount in relation to the price of

The fact that on September 4, No. 2 Hard Winter wheat sold at a discount under the September future, though it is the grade of wheat currently deliverable on the future, is accounted for by the fact that the spot price applies to wheat "on track," requiring additional expenditure to get it into a warehouse.¹⁷ Wheat was then moving into commercial storage on a large scale because of heavy marketing by producers.

On September 4, our grain merchant or processor would probably not have sold the wheat he bought earlier, but instead would have bought more wheat. If he did that, and held until December 1, the results, in cents per bushel, would have appeared as follows:

Quotation	Date and Price Sept. 4	Date and Price Dec. 1	Gain or Loss
Spot No. 2 Hard (low) December future	232 $\frac{1}{2}$ 238 $\frac{1}{4}$	252 252
Spot premium	-5 $\frac{3}{4}$	0	+5 $\frac{3}{4}$ (gain)

In this case the spot price of the cheapest deliverable wheat came, on December 1, to exact equality with the price of the December future, and the gross return for storing the wheat was exactly what might have been expected, on September 4, from the fact that such wheat was then selling at a discount of 5 $\frac{3}{4}$ cents under the price of the December future.

the *July* future, the prospective hedger bearing in mind the prevailing discount of the *July* future under the *September*.

Since the gain or loss from hedging calculated in such tabulations as that in the text above depends only on the spot premiums, the prices included in the tabulations are no more than interesting collateral information. The spot premium or discount for a specified quality of the commodity rarely changes much during the course of a day or even a week. With regard to the futures prices, however, it is pertinent to note the time of day. Those used here are the closing prices for the day. The spot prices are closing prices of the future currently being used as a basis for spot sales, plus the quoted premium for lowest quality No. 2 Hard Winter wheat. The source is the Kansas City *Grain Market Review*, which quotes also daily high and low spot prices for the various grades, in which the low quotation for each grade is obtained by adding the premium for lowest quality wheat in that grade to the lowest price of the future for that day.

"Sometimes the spot price on track in a delivery month falls to a considerable discount under the near future because of lack of warehouse space for economical storage. The spot price on track tends to be at a *discount* under the price of a current-month future, which is then also effectively a spot price, when the prevailing direction of movement of the commodity is into storage; it tends to stand at a premium over the future when the prevailing direction of movement is out of storage. Moreover, the spot quotations for the cheapest wheat of deliverable grade may represent wheat of slightly better quality than that which will be delivered on futures contracts. To be graded No. 2, wheat must meet all of several requirements; the wheat delivered on futures contracts may be at or near the minimum in all respects when the cheapest wheat on which spot quotations are available is close to the minimum in only one of the grade requirements."

In these calculations we have left out of account the possibility that a merchant who bought at a discount of $5\frac{3}{4}$ cents on September 4 might have got wheat of a little better than minimum No. 2 quality—wheat which might have been sold on September 4 at a discount of, say, $5\frac{1}{2}$ cents, rather than $5\frac{3}{4}$ cents, if the seller had been willing to look farther for a buyer. And we have ignored the possibility that on December 1 the merchant might have sold at a premium of $\frac{1}{2}$ cent over the December future by virtue of the slightly superior quality of the wheat, and by finding a buyer who did not choose to shop around enough to get the best bargain possible. In other words, we have left out of account sources of normal *merchandising* profits.

On December 1 a merchant or processor may seem to have had no incentive for longer holding of wheat for which he had no immediate need. The spot price then was on a par with the December future, and at a premium of 1 cent over the price of the May future. But let us suppose that he continued to hold, with a hedge in the May future, and see what would have happened if he held until May 1. Though we imagine that the wheat is already in storage, we may make the next calculation as though it concerned a new purchase:

Quotation	Date and Price		Gain or Loss
	Dec. 1	May 1	
Spot No. 2 Hard (low) May future	252 261	247 $\frac{1}{4}$ 238 $\frac{1}{4}$
Spot premium	+1	+9	+8 (gain)

This time a merchant would have gained a gross return of 8 cents per bushel from storage. It would have been in part a windfall profit, since he had no advance *assurance* of obtaining it; but he would have gained it on a quite conservative venture. He was well assured of not losing more than 1 cent per bushel (because the spot wheat that he held would surely sell at as high a price as the May future at some time in May), and he could count with virtual certainty on spot wheat going to a substantial premium over the price of the May future at some time between December and May.¹⁸

As of May 1, there remained no prospect of profit from continued storage of wheat during that crop-year, unless perhaps for a few days more. Before the end of the month, the spot premium, based on the

¹⁸ One of the indications of this prospect was the fact that spot wheat had already reached a premium of 1 cent over the May future by December 1. The cause, of which any holder of large wheat stocks would have been well aware, was the holding by growers of some 300 million bushels or more under nonrecourse loans offered by the Commodity Credit Corporation.

May future, would have to fall from 9 cents to near zero.¹⁹ Moreover, the spot price on May 1 was at a premium of 18 cents over the July future, and that premium should be expected to fall to zero or below by July 1. The outcome, if a merchant in fact held any wheat in storage from May 1 to July 1, was as follows:

Quotation	Date and Price		Gain or Loss
	May 1	July 1	
Spot No. 2 Hard (low) July future	247½ 229½	218½ 225
Spot premium	+18	-6½	-24½ (loss)

Probably some merchants did store a little wheat from May 1 to July 1, hedged in the July future, and did take the loss per bushel indicated by the above calculation. Grain merchants, like operators of retail stores, must try to keep adequate stocks on their shelves to serve their customers. But a merchant who hedged would have seen clearly on May 1 that any wheat that he might continue to hold until July would involve a loss, as surely, though not so completely, as would Christmas trees held until December 26.

The foregoing examples of hedging tend in one respect to be a little misleading; spot premiums do not always follow so obviously logical a pattern through the course of a crop year as they did in 1951-52. If spot wheat in July, were regularly, in all years, at a moderate discount under the September future, and if spot wheat, in September, were always at a large discount under the December future, and spot wheat in May always at a large premium over the July future, merchants and processors would have less need than they do for futures markets.²⁰ They would then have no need to watch spot-future price relations in order to judge when to accumulate stocks, and when to draw them low. But our purpose at the moment is merely to see how hedgers use spot-

¹⁹ Not necessarily to zero, because deliveries on futures contracts would consist of wheat in public elevators; in May, wheat on track tends to be worth more than the same quality of wheat in a public elevator because it is already loaded in a freight car and ready to be moved to wherever it is wanted.

²⁰ When spot wheat in May is at a premium over the July future, it is not because the new wheat crop—coming to market in large volume by July—is expected to be large, but because current supplies of old wheat are scarce. (In May 1952 the scarcity applied only to commercially available supplies, being a result of the large holdings of wheat by the Commodity Credit Corporation in connection with its price-support operations.) On the subject of “inverted” intertemporal price relations in general, see Holbrook Working, “Theory of the Inverse Carrying Charge in Futures Markets,” *Jour. Farm Econ.* (Feb. 1948), XXX, 1-28; “Professor Vaile and the Theory of Inverse Carrying Charges,” *Jour. Farm Econ.* (Feb. 1949), XXXI, 168-72; and “The Theory of Price of Storage,” *Am. Econ. Rev.* (Dec. 1949), XXXIX, 1254-62.

futures price relations as a guide in inventory control, thereby earning a return for holding stocks that must be stored by someone. We may reasonably avoid being led here into discussion of the frequent effects on spot premiums produced by exceptional export demand, by governmental price supports, or by unusual holding disposition on the part of producers.

We should now note three facts concerning hedging. First, contrary to a common impression, hedging of the sort here considered is not properly comparable with insurance. It is a sort of arbitrage. We shall consider later an example of conditions under which hedging may in fact be profitably compared with insurance, but such conditions obtain for only a small proportion of the hedging that is done on futures markets. Most hedging is done in the expectation of a change in spot-future price relations, the change that is reasonably to be expected being often indicated quite clearly by the current spot-future price relation.

Secondly, hedging does not eliminate risks arising from price variability. Risk is less than on stocks held unhedged, but it still exists. When the commodity involved is of quite different quality than that represented by the future, or in a location remote from that to which the futures price relates, the risks assumed by hedgers tend to be much larger than is suggested by the examples given here.

And thirdly, hedging is not necessarily done for the sake of reducing risks. The rôle of risk-avoidance in most commercial hedging has been greatly overemphasized in economic discussions. Most hedging is done largely, and may be done wholly, because the information on which the merchant or processor acts leads logically to hedging. He buys the spot commodity because the spot price is low *relative to* the futures price and he has reason to expect the spot premium to advance; therefore he buys spot *and* sells the future. Or in the case of a flour miller, he sells flour for forward delivery because he can get a price that is favorable *in relation to* the price of the appropriate wheat future; therefore he sells flour *and* buys wheat futures. (Here the arbitrage, it may be noted, is between two forward prices, that for flour and that for wheat.)²¹

Incidentally, recognition of the fact that hedging may be done purely as a logical consequence of the reasoning on which the hedger acts (reasoning, for example, that the spot price is low relative to the

²¹ Two instructive explanations of hedging written by hedgers themselves, such as are not often found, are: Ellis D. English, "The Use of the Commodity Exchange by Millers," *Proceedings, Fifth Annual Symposium* (Chicago Board of Trade, 1952, mimeo.) pp. 22-29; Virgil A. Wiese, "Use of Commodity Exchanges by Local Grain Marketing Organizations," *ibid.*, pp. 108-16.

future) rather than from any special desire to minimize risks, helps to explain why many dealers and processors sometimes hedge and sometimes do not. As we have remarked, merchants and processors, even though they hedge, have need to keep informed on conditions that affect the price of the commodity and they may often have opinions on prospective price changes. If a merchant is accumulating stocks at a time when spot premiums are low—his most reliable basis for such action—and if at the same time he is fairly confident of an advance in futures prices as well as in spot premiums, why should he not carry the stocks unhedged, if he can afford to take some extra risk?

Perhaps the main reason that hedging, as commonly practiced on futures markets, has been so widely misunderstood and misrepresented is that economists have tried to deal with it in terms of a concept that seemed to cover all sorts of hedging. This would be desirable if it were feasible, but the general concept of hedging as taking offsetting risks wholly, or even primarily, for the sake of reducing net risk, serves so badly as applied to most hedging on futures markets that we need another concept for that most common sort of hedging. To put it briefly, we may say that hedging in commodity futures involves the *purchase or sale of futures in conjunction with another commitment, usually in the expectation of a favorable change in the relation between spot and futures prices.*

An unfortunate consequence of the prevalent misconception of hedging has been that, while it has correctly credited futures markets with allowing merchants and processors to curtail their risks, it has diverted attention from a service of probably larger economic importance. Merely by supplying simultaneous quotations applying to various subsequent dates, futures trading tends to promote economically desirable control of stocks; and futures markets, through their use for hedging, make the holder of stocks sharply aware of any losses that must be expected from carrying unnecessary stocks in times of relative shortage of supplies, and provide assured²² returns for storage over periods when there is a surplus to be carried. A merchant or processor with warehouse facilities will undertake storage in response to prospect of a 10-cent per bushel gain from carrying hedged stocks about as readily as he will undertake storage in response to an offer of 10 cents per bushel as a fee for storing government-owned grain. Indeed he may undertake storage for the return promised by hedging more willingly than for the fee, because the stocks that he holds hedged need be carried only as long as he wishes, and can be a source of convenience or of profit in connection with his merchandising or processing business. The argu-

²² Though subject to some risk, as we have seen.

ment often made that management of reserve stocks of commodities should be a governmental function rests in large part on ignorance of the effectiveness with which the hedging facilities of futures markets assure private carrying of stocks in about as large a volume as can be justified on purely economic grounds.²³

The claim sometimes made by able economists²⁴ that prices of such storable commodities as wheat, corn, and cotton fluctuate excessively because stocks are accumulated at wrong times, and not accumulated when they should be, seems also a consequence, indirectly, of the prevalent misconception of hedging. Mismanagement of stocks by nonhedgers would have to be on a very large scale to produce an over-all tendency toward perverse stockholding in any commodity with a futures market much used for hedging.²⁵

IV. Price Fluctuations

Futures trading tends to emerge and persist especially in commodities which are subject to exceptionally large price fluctuations, arising from unpredictable variations in production, from other supply uncertainties, and from relative inelasticity of consumption demand.²⁶ Susceptibility of a price to large and unpredictable changes tends to stimulate hedging, and therefore futures trading, whether handlers of the commodity seek insurance against the risks of price change, or are led into hedging merely because they find spot premiums a more reliable guide to inventory control than are the prices themselves. (The relative superiority of spot premiums as such a guide depends of course on the price variability.) On this account, the fact that prices of commodities which have

²³ If considerations of national defense warrant the carrying of commercially uneconomic stocks of a commodity, government should of course assume the responsibility and the financial burden of carrying such excess stocks.

²⁴ For example, T. W. Schultz in *Production and Welfare of Agriculture* (New York, 1949), pp. 172-74.

²⁵ The hypothesis of perversity of stockholding tendencies is not supported by any statistics that I know, but is contradicted by them. Of particular interest is the fact that in the years when one could speak realistically of a world wheat market, the countries in which year-end (June 30) stocks of wheat varied in rational correspondence with world wheat supplies were the countries where hedging was practiced on a substantial scale. In most countries, year-end stocks of wheat varied little, and primarily with size of the previous *domestic* crop. Britain, with a futures market but with only small storage facilities, contributed little to the carrying of world wheat surpluses. Canada contributed more; and the country which most consistently carried large stocks at the end of any year of world wheat surplus, and reduced stocks to a minimum in times of world wheat shortage, was the United States. Cf. Holbrook Working, "The Changing World Wheat Situation," *Wheat Studies* (Sept. 1930), VII, 433-52.

²⁶ No reference is made here to changes in demand as a cause of *exceptional* price variability, because those demand changes which contribute to price instability of staple commodities are mainly of the sort that affect all sensitive prices similarly.

futures trading are found to be more variable than most other prices gives no ground for supposing that futures trading is a *cause* of the exceptional price variability.²⁷ It is none the less pertinent to raise the question whether existence of futures trading has a stabilizing or destabilizing influence on prices, and to seek some objective evidence on the question.

The results of attempts to determine whether prices of commodities that have futures trading fluctuate more or less than they would in the absence of futures trading have been generally inconclusive. Even if clear proof were given that futures trading tended somewhat to restrict price fluctuations, it might still be true that futures prices fluctuate too much. Some criterion is needed for an absolute test by which to determine whether the price fluctuations that occur are excessive, or are, in the main, rational and desirable responses to changing economic conditions and information.

A few years ago I suggested that such a test might be developed from the consideration that prices of durable goods (and especially futures prices) reflect expectations.²⁸ These expectations are always subject to error, but the errors of expectation might, in an *ideal* market, be only such as must arise from uncertainties inherent in the economic situation. That is, the price of May wheat, for example, might fluctuate, and yet be always the best estimate that could be made at the moment of what the price of wheat should be next May. *Excessive* price fluctuations might be measurable as the amount of fluctuation that occurred over and above the amount attributable to unpredictable changes in the economic situation. Unpredictability of change would thus be taken as the ideal in price behavior.

This idea has been pursued, and appropriate statistical methods have been devised for making the suggested tests.²⁹ For technical reasons the new approach to the problem of testing price behavior has been applied first to appraisal of the frequent and sometimes large price fluctuations that occur on active futures markets during the course of a day. The results indicate some departure of actual price behavior from the ideal, as was to have been expected, but only slight departures; the observed

²⁷ It appears sometimes to be so taken, nevertheless, even by economists who would be expected to see the fallacy of such an inference.

²⁸ "The Investigation of Economic Expectations," *Papers and Proceedings, Am. Econ. Rev.* (May 1949), XXXIX, 158 ff.

²⁹ The tests involve in principle the measurement of serial correlation among price changes, which in practice must be present to some extent if price changes are predictable (that this is so may seem obvious, but the proof requires more space than is available here). The statistical measures used have been especially devised to be more sensitive than serial correlation coefficients to the sorts of departure from randomness of change that are to be expected in price series. They have also an advantage of economy in use.

price fluctuations were for the most part such as should occur purely from unpredictable changes in price prospects.³⁰

In an ideal futures market in which the price of May wheat, for example, was at all times the best possible estimate of what the price would be next May, no speculator would be able to consistently make money, and the speculation necessary to maintain even an approximation to ideal price behavior would tend to vanish. Speculative profits that are not purely the result of chance must rest on ability to anticipate price changes with some degree of reliability, whereas if a futures price were always the best possible estimate of price at a later date, its changes would be entirely unpredictable.³¹ Since many professional traders do make money in actual markets with some degree of consistency, it is evident that they are able to anticipate price changes with some approach to reliability and hence that the price behavior is not ideal. Study of the nature of the price fluctuations that professional traders are able to anticipate may therefore give the best clue to the nature of the imperfections of actual speculative markets—the predictable price fluctuations that would be absent in an ideal futures market, but that are present in actual markets.

Perhaps the largest class of professional traders is that of "day traders"—those who operate primarily on intraday price fluctuations, and who end each day neither net long nor net short in appreciable amount.³² One such trader in cotton had the following record over a two-month period chosen substantially at random.³³

Month	Number of Transactions ^a		Average Daily Sales (million pounds)	Gross Profit ^b		Number of days with	
	Total	Per day		Cents per lb.	Percent	Gain	Loss
February	1701	77.4	4.9	.0167	.042	15	7
March	1343	64.0	4.2	(6)	(6)	13	8
Total	3044	70.8	4.6	.0093	.023	28	15

^a Purchases and sales.

^b Per pound or per dollar of sales.

^c Infinitesimal; a gross profit of \$187.00 on \$35 million of sales.

³⁰ The relative amount of departure from ideal behavior has been measured numerically, but it is not possible to summarize the results meaningfully in brief.

³¹ Price changes would always be consequences of new information, unavailable as a basis for prediction before the price change occurred.

³² Professional traders specialize to such an extent as to make classification meaningful, and the intraday traders especially tend to concentrate on one type of trading.

³³ The record was obtained for this individual because he was regarded as a representative, successful, day trader. The period was simply the two months ending at the time (in 1952) when he was interviewed.

During the two months of the record, this man averaged nearly 70 trades per day, which is at the rate of about one every four minutes. His purchases were not bunched during the parts of the day when prices were low, nor his sales bunched during the parts of the day when prices were high, but purchases and sales were distributed throughout the price range of the day.³⁴ He made money simply by managing to have his purchases, on the average, at prices a little lower than the prices of his sales. On the days on which he made money, his gross profits averaged $\frac{1}{30}$ cent per pound. Since the cotton price was about 39 cents per pound, his gross profit on the days when he made money was about 82 cents per thousand dollars worth of cotton that he bought and sold. Net profits, after paying commissions and other business expenses, were substantially less.

The gross profits calculated above are on trading during only the 28 days out of 43 on which he made money. On 15 out of 43 trading days during the two months, he lost money. Such a result might not be surprising in the case of a man who made only a few trades each day, but 70 trades per day—about 35 purchases and 35 sales—gave much opportunity for successes and errors to offset within a day. Nevertheless, he lost money on more than one day out of three, on the average. This is not the sort of experience that most people imagine successful professional traders as having.

Because profits were so uncertain and variable, a calculation of the average rate of profit of this trader over even a two-month period may not give a very reliable indication of the normal profit expectation for such a trader. The figures, for whatever they may be worth, show that in the first of the two months, his gross profit averaged $\frac{1}{60}$ cent per pound; in the second of the two months, losses nearly equalled gains—his total gross profit for the month would not have covered the commission charges he often paid on a single day's trading. For the two months together, his gross profits averaged about 23 cents per thousand dollars worth of cotton sold—less than one-fortieth of one per cent. Doing such business, he could make a living only by dealing in great quantities of the commodity; he bought and sold an average of over nine thousand bales of cotton—4.6 million pounds—per day.³⁵

Another day trader, who was not primarily a true scalper, but sought principally to trade on larger price fluctuations within a day than those

³⁴ This was ascertained by separately tabulating purchases and sales each day in frequency distributions according to price.

³⁵ Incidentally, the fact that a gross profit of 23 cents per thousand dollars worth of purchases and sales could permit any net profit at all is striking evidence of the main technical characteristic of futures trading, the economy with which transactions can be made.

on which pure scalpers operate, found that his gross profits during the previous seven months, on the Chicago Board of Trade, averaged 70 cents per thousand dollars of sales—seven hundredths of one per cent. The period beginning with January 1952 was one which he described as especially successful. Giving particular attention, as he did, to somewhat larger price fluctuations than occupy the pure scalper, he made relatively few trades per day in any one commodity, but a considerable total number because on most days he did trading in five or six different commodities.³⁶

One might seek to get a large number of records such as those summarized above, and for longer periods, in order to arrive at a conclusion regarding *typical* behavior and profits of day traders, but it is clear from this and other evidence, that the typical day trader and his profits would prove about as elusive as the typical insurance salesman and his income. These records, by themselves, serve as warning that some popular concepts of the manner in which professional traders operate, and of the sources of their profits, may be quite mistaken. With other and more detailed records, they give valuable aid in interpreting results of statistical measurements of price behavior, made on the principle outlined above.³⁷ All of the evidence converges toward the conclusions that: (1) the price movements that day traders are able to anticipate with even moderate reliability are usually small relative to the total price range for the day; (2) the reliability of their judgment is rather low; and (3) the over-all effect of their trading operates strongly toward “smoothing” the course of prices, helping to make intraday price fluctuations conform closely to our criterion of ideal behavior.

These conclusions bear directly on the question whether the price fluctuations that occur in futures markets within the day tend to be excessive or not. The question is not inherently a very important one because, though price fluctuations in the two months of the illustration covering cotton resulted in an average difference of 0.4 cent per pound between the lowest price and the highest price each day, it would not matter greatly if fluctuations of such magnitude did occur without good reason. The conclusions reached are more important than the specific question to which they apply, because they indicate reasonableness in just that trading and those price fluctuations which may be thought most likely to be unwarranted.

On the question whether the larger price fluctuations that occur over longer periods are in the main warranted, the best evidence that I

³⁶ A feat comparable to that of playing several games of chess simultaneously, blindfolded.

³⁷ A full report on the research will be published shortly.

can yet cite³⁸ is essentially subjective and inconclusive. It is the evidence which led me to question the common assumption, and to try to measure the amount of "excessive" fluctuation that is present in "speculative" prices. During the twenty years of publication of *Wheat Studies* by the Food Research Institute, members of the research staff periodically studied the recent fluctuations of wheat prices and sought to interpret them as warranted by current developments, or unwarranted. For much of that period we sought three times a year to appraise price prospects for the next several months. Everyone concerned with these efforts gained a great respect for the rationality of the price behavior observed. During twenty years some price movements occurred which it seemed possible to appraise at the time as ill-founded or excessive, but these were exceptional. Only rarely did it seem possible to anticipate subsequent price movements with confidence on the ground that the current price appeared unjustifiably high or low.

As regards price changes from year to year, it is entirely clear, as noted in the previous section, that futures markets contribute substantially toward desirable adjustment of stocks carried from one year to another. Whether or not they produce as much flexibility of storage as is desirable they at least operate in that direction.

V. Costs of Hedging

We turn now from topics on which there has existed major disagreement, springing largely from imperfect or mistaken concepts, to examine a new, or at least largely neglected, idea that illuminates hitherto obscure aspects of futures trading. The idea came to me through puzzling over two questions:³⁹ Why does futures trading in a commodity tend to concentrate largely or wholly in one exchange? And why is futures trading on any one exchange usually confined to a single set of contract specifications for a commodity, rather than distributed among several contracts, representing different qualities of the commodity? Hedgers, it may seem, would be best served by having numerous futures exchanges, and several different futures contracts in each, so that hedges could be placed always in a future that applied to a quality of the commodity corresponding closely with that being hedged, and to a location at or near that of the hedged stocks. The answer seems to lie in a cost of hedging.⁴⁰

³⁸ Pending completion of research under way.

³⁹ And also from what we learned in the study of intraday price behavior referred to above.

⁴⁰ I thought at first that the answer lay in a somewhat capricious behavior of speculators, coupled with a necessity for hedgers to use those exchanges and contracts in which there was sufficient speculation to carry the hedges. But, when this argument was advanced in a paper dealing with a special case ("Western Needs for Futures Markets," mimeo., Food Research Institute, 1952) it drew objections that seem fatal.

There are at least two significant elements to be considered as parts of the cost of hedging.⁴¹ The most obvious one is the commission charge that must be paid on futures transactions.⁴² Futures trading must operate with great efficiency to keep this charge so low as not to discourage hedging seriously, since much of the advantage that a hedger gains, as we have seen, comes from a guidance in inventory control that is available without actually placing hedges. In addition to commissions, there is a cost of hedging that can be much larger, arising from what may be called the bivalence⁴³ of market price. The contribution of price bivalence to costs of hedging declines sharply, as we shall see, with increase in the volume of business done on an exchange, and it declines also with increase in the volume of business in a particular futures contract. It has, therefore, just the characteristics needed to explain observed tendencies in the concentration of futures trading.

Our awareness of the fact that there are usually two (or more) prices for a commodity unit of specific quality in any market at a given time is dulled by the convention of treating wholesale and retail prices as though they were registered in separate markets. But of course they are in fact two separate prices within the same market, differing because of a service that (at least presumptively) goes with the commodity when it is sold at retail.

When, as in the case of houses, for example, the circumstances of trade do not favor distinction between wholesale and retail prices, there remain price differences according to the conditions of sale. Even under stable and well-known market conditions the man who chooses to sell without much search for someone who particularly wants a house like his, takes one price, and the man who chooses to buy without much "shopping" pays a higher price. The difference between the two prices need not represent any exploitation of bargaining weakness, but only a fair margin for an intermediary. Or in a country grain market, a merchant may buy wheat of a farmer at one price and sell it almost immediately to a poultry raiser at a higher price. The difference, again, is likely to represent only a return for service, small in this case because a poultry raiser who had reason to believe that the difference would be large would seek out the farmer and buy from him directly.

In terminal commodity markets (and in security markets) there ap-

⁴¹ One might choose to regard potential speculative profits foregone as a cost of hedging; but though a potential hedger may wisely take account of potential profits from speculation in deciding whether to hedge or not, I think that treating foregone speculative profits as a cost of hedging would not be the best way of taking them into account.

⁴² And if the hedger maintains an exchange membership for the sake of the consequent saving in commissions, there are membership expenses to be counted as part of the cost.

⁴³ Using "bivalent" to mean "two-valued" rather than, as in chemistry, "having a value of two."

pear the same sort of price differences, though smaller, that provide the margin on which merchants in such markets principally operate. In large central markets the small price differences which provide these margins cannot be realistically treated as differences between a wholesale and a retail price. They tend then to be clearly reflected in price quotations only through differences between "bid" and "asked" prices.

A merchant who hedges usually finds his situation in the futures market the opposite of that which he enjoys in the spot market. In his spot dealings he buys at bid prices and sells at the higher asked prices (a fact that we ruled out of consideration in our illustrations of hedging, because we were there concerned with storage and its returns). In his futures dealings, on the contrary, he tends to buy at asked prices and to sell at the lower bid prices. At least he prefers to do so, unless the margin between bid and asked prices is so wide that he is forced to "shop" in the futures market, as well as in the spot market. The merchant is paid for his services to processors and exporters by *receiving* an asked price, and he in turn is willing to pay for corresponding services of dealers in futures by buying often of them at asked prices.

The dealers in futures from whom a hedger often⁴⁴ buys at asked prices, or to whom he sells at the lower bid prices, are the so-called scalpers, or other day traders.⁴⁵ We saw in the last section some evidence on the very narrow margin which such dealers in futures take. From that evidence it would appear that their margin is of the order of $\frac{1}{14}$ to $\frac{1}{40}$ of one per cent. Those figures, however, represent averages that are somewhat "watered down" by the effects of transactions between day traders themselves.⁴⁶

Another way of estimating the dealer's margin that a hedger tends to pay on his futures transactions is from the profit margin that scalpers try for. In wheat on the Chicago Board of Trade, this has been typically $\frac{1}{8}$ cent per bushel, or a little over $\frac{1}{20}$ of one per cent at recent prices. An estimate so derived, however, tends slightly to overstate the margin

⁴⁴ "Often," because the purchase or sale of futures made by a hedger does not necessarily go through the hands of an intermediary scalper.

⁴⁵ A scalper, in the strict sense, may be characterized as always willing to either buy at $\frac{1}{8}$ cent below the last price or to sell at $\frac{1}{8}$ cent above the last price (or at such other difference from the last price as market conditions permit); he operates purely on the difference between bid and asked prices, as ordinarily understood. Other professional day traders perform an essentially similar function, but at least partially with respect to somewhat larger price differences. Bid and asked prices tend to be farther apart for large quantities than for small quantities of a commodity.

⁴⁶ The first of any pair of transactions by a scalper is made in the belief that he is buying "below the market" from an urgent seller, or selling "above the market" to an urgent buyer. But scalpers often find that they have misjudged the market, or that it has turned against them immediately after such an initial transaction. Then they seek to make the offsetting transaction quickly, often at a loss, and often to another day trader.

actually paid by a hedger, because hedgers benefit from scalpers' mistakes of judgment.

A third basis for estimating the margin that hedgers pay on their futures transactions is afforded by data showing that a loss of 0.21 cents per bushel was taken by processors and terminal grain merchants on 109 million bushels of wheat futures bought (and sold) over a nine-year period.⁴⁷ If the futures transactions were virtually all hedging transactions, as may reasonably be assumed, this indicates a hedging cost, in addition to commissions, of slightly over $\frac{1}{5}$ cent per bushel, or less than $\frac{1}{5}$ of one per cent of the average wheat price over the period. This is a cost figure, however, that includes speculative profits foregone⁴⁸ (or, to put the same thing in another light, that includes any return to speculators for carrying the hedges). And it is in any case a cost per bushel bought and sold, whereas the foregoing estimates of scalpers' margins might tend to be paid on purchases and on sales alike. So there is at least no evident inconsistency between these data and the previous estimates of scalpers' margins.

Whether scalpers' margins are less than $\frac{1}{10}$ per cent, or as much as $\frac{1}{5}$ per cent, a merchant or processor can afford that cost in addition to

⁴⁷ The data, from Blair Stewart, *An Analysis of Speculative Trading in Grain Futures*, U. S. Dept. Agric., Tech. Bull. No. 1001 (Oct. 1949), Table 27 (the calculations of loss per bushel are mine) are as follows:

Business	No. of Firms	Transactions (thousand bushels)	Loss (thousand dollars)	Loss per Bushel (cents)
Terminal grain merchants	45	76,054	174	0.23
Processor	44	33,407	55	0.17
Total	89	109,461	229	0.21

Similar data, from the same source, on hedging transactions amounting to 9.6 million bushels by 33 country and subterminal grain merchants, show a loss of 2.6 cents per bushel on their transactions in futures. The magnitude of this loss indicates that more of the hedges against wheat stocks by this group of dealers were carried in periods of rising prices than in periods of declining prices. The classes of grain merchants involved commonly practice discretionary hedging, and those represented in the data apparently chose to hedge at such times that they "protected" themselves against profits from price increase somewhat more than against losses from price decreases. The results tabulated above for terminal grain merchants and processors may also be affected to some extent by the practice of discretionary hedging, though it is much less prevalent among such wheat handlers than among country and subterminal merchants.

⁴⁸ Which we wish to leave out of account here, as previously noted. It is scarcely possible to deal with them in general terms, except in such a global average as the one just given, because their magnitude depends so much on special circumstances, including the knowledge and judgment of the hedger.

commission charges of, say, $\frac{1}{10}$ of one per cent.⁴⁹ His own dealer's or processor's margin, though small, is usually several times the total of these costs of hedging.

In small and relatively inactive futures markets, however, scalpers must take much wider margins than in the circumstances to which the foregoing data apply.⁵⁰ They must do so primarily because their volume of business is restricted to perhaps half-a-dozen transactions per day, or less, as compared with the 70 transactions per day of the cotton trader cited. And, secondly, they must do so because their risks are greater. In an active futures market, a scalper can usually buy and resell within the space of a few minutes, running little risk that some change in news will involve him in a serious loss. In inactive markets, purchase and sale may be separated by hours, or the scalper may buy today and have to wait until tomorrow to sell, running correspondingly large risks of loss from unpredictable developments. And because scalpers must take wider margins on inactive markets, hedging on them is more costly than on active futures markets.⁵¹ Consequently, if a hedger has two futures markets to choose between he tends to do his hedging in the more active one.⁵²

The element of hedging cost that arises from scalpers' margins, or from the inconvenience and price disadvantages incurred in the absence of scalpers, explains the restriction of trading almost universally to a single futures contract on one exchange, in the same way that it explains the tendency for futures trading in a commodity to concentrate mainly or wholly on some one exchange. When two futures contracts are offered for trading applying to different descriptions of the commodity, trading tends to become more active in one of them than in the other; scalpers' margins then rise on trading in the less active contract, leading to

⁴⁹ Commission charges are not fixed as a percentage of the price; expressed so, they depend on the price, and they vary rather widely among commodities and exchanges, and according to whether the transaction is for a member of the exchange or a nonmember. The figure of $\frac{1}{10}$ of one per cent is representative of commissions for commodities and exchanges with a fairly large volume of business and low commission rates, and is therefore applicable to most of the hedging that is done.

⁵⁰ Part of the difference in gross profit obtained per \$100 of transactions by the two day-traders for whom data were given, is accounted for by the fact that the second trader operated mainly in commodities which have only moderately active trading.

⁵¹ At some point not very far down on a scale of diminishing market activity, it becomes impossible to conduct scalping as a specialized form of trading and to make a living at it. Then the scalping function is performed by some speculators, and the distinction between scalping and speculation becomes blurred.

⁵² The preference, as commonly expressed in trade circles, is for a "broad" market as against a "thin" market. This terminology expresses the fact that size as well as frequency of transactions is important. On the supposition that most readers would understand "active" to mean about what a trader calls "broad," I have thought it unnecessary to introduce the trade terminology into the exposition.

further concentration of hedging, and of other trading, in the more active contract. For example, after five years of use of the Californian wheat contract for futures trading at Liverpool, trading was initiated also (in 1891) in an American Red wheat contract. The latter proved the more popular, and in spite of the important difference between the two kinds of wheat, quickly drew trade away from the Californian contract to such an extent that trading in the Californian was presently abandoned.⁵³ Maintenance of futures trading in two descriptions of a commodity on any one exchange was found generally impractical early in the history of futures trading, and has rarely been tried in recent years.

These conclusions have some interesting implications. If we are correct in inferring, as seems necessary, that hedgers' responses to cost differentials account for the observed tendency toward concentration of futures trading dominantly or wholly in some one exchange, and wholly in some one contract on each exchange, it follows that hedgers are as a rule unwilling to pay for superior hedging facilities. Does this mean that hedging is usually considered worth while only if it is very cheap—that its advantages are really not very great? Or does it mean something else?

VI. "*Insurance*" Hedging

The question posed above may well be considered in a concrete situation. Grain merchants and flour millers in the Pacific Northwest of the United States have long sought to gain and hold the advantages of futures trading in a contract well suited to their needs. Largely because of the great distance between that area and the main wheat-producing regions of the country, wheat prices in the Pacific Northwest are only loosely tied to prices at Chicago or Kansas City. When the Chicago futures price represents hard wheat, as has commonly been the case,⁵⁴ the important quality difference between hard wheat and the soft wheat typical of the Pacific Northwest contributes to disparity of movement between Chicago and Pacific Northwest wheat prices. No. 1 Soft White wheat in Portland or Seattle may sell at 20 to 30 cents per bushel under the spot price of contract wheat at Chicago, or it may sell at 10 cents per bushel, or more, above the Chicago price. Chicago futures consequently afford a very imperfect hedge for soft wheat in the Pacific Northwest.

Efforts to provide good hedging facilities for Pacific Northwest wheat have included maintenance, over many years, of futures trading at

⁵³ Cf. Holbrook Working and Sidney Hoos, *op. cit.*, p. 144.

⁵⁴ Though during the last few years the Chicago future has most of the time been effectively a soft-winter wheat future because the deliverable soft wheat was cheaper than deliverable hard wheat.

Seattle and, until 1942, at Portland also. These markets did not flourish,⁵⁵ and in 1950 the experiment was tried of providing for trading in North Pacific Coast wheat futures on the Chicago Board of Trade (with delivery on the Pacific Coast). The special Chicago contract failed to attract enough business to warrant its continued use; it seemed to serve only to draw business away from Seattle.

The volume of hedging in a Pacific Northwest wheat futures contract must necessarily be a fairly small fraction of total wheat hedging in the United States, because total wheat production in the area is only some 10 to 12 per cent of the national wheat crop.⁵⁶ Moreover, there is relatively less occasion for hedging in the Pacific Northwest than in most other areas of concentrated wheat production in the United States, because of abundant "country" storage facilities and a widespread disposition of growers to retain ownership of their wheat for considerable periods after delivery.⁵⁷ But even so, there could have been a lively business in Pacific Northwest wheat futures if commercial stocks of wheat in that area had not been held to such a large extent either unhedged, or hedged in futures markets of the Middle West, especially Chicago (and in the standard contract there).

Decision of a wheat merchant or processor in the Pacific Northwest to hedge in Chicago futures rather than in a Pacific Northwest futures contract is only a rather extreme example of the sort of decision often made by hedgers—to take inferior risk protection for the sake of a saving in cost. Even though he hedges in Chicago futures, a merchant or processor in the Pacific Northwest can still rely on prices of the Seattle futures for guidance in deciding whether to buy for storage or not to buy.⁵⁸ If he buys because the relation between the spot price and a Seattle futures price promises a return for storage, he may still decide to hedge in a Chicago future with only the result that he will take more risk, but not so much risk as though he held the wheat unhedged. In other words, the decision on where to place the hedge concerns only the insurance aspect of hedging.⁵⁹

⁵⁵ See data on open contracts in wheat futures, by exchanges, in *Commodity Futures Statistics*, U. S. Dept. Agric., Stat. Bull. No. 107 (1952), pp. 5, 10, and earlier publications in the series.

⁵⁶ Opinions differ as to how the "Pacific Northwest" wheat area should be defined, but on any reasonable definition, it does not follow the boundaries of states, which are the units for wheat production statistics; consequently the production of the area can be stated only roughly.

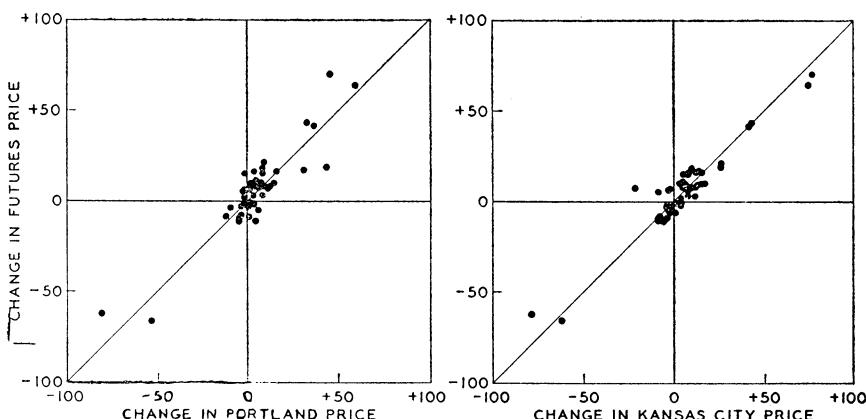
⁵⁷ Cf. J. S. Davis, "Pacific Northwest Wheat Problems and the Export Subsidy," *Wheat Studies* (Aug. 1934), X, 377.

⁵⁸ Though of course, if too little hedging is left for the Seattle market, even the guidance afforded by its prices will be lost.

⁵⁹ Unless he expects a change in the relation between Seattle and Chicago prices, in which case the hedging problem becomes entangled with one of intermarket arbitrage.

A merchant or processor choosing between Seattle and Chicago futures as the medium for hedging that he has decided to do is in much the same position as though he were taking out casualty insurance, and choosing whether to take full coverage or coverage only for losses above some stated minimum. The choice he makes is whether to take coverage on all insurable risks, at a fairly high cost, or to insure only against serious loss, at a considerably lower cost. The chief function of insurance is to give protection against serious, crippling, loss. Carrying insurance against small losses that occur frequently is ordinarily poor business because the holders of the insurance have to pay the losses,

CHART 1.—RELATIONS OF TWO-MONTH CHANGES IN PRICES OF CHICAGO WHEAT FUTURES TO SIMULTANEOUS CHANGES IN PORTLAND AND KANSAS CITY SPOT PRICES,
SEPTEMBER 1946 TO MAY 1952*
(cents per bushel)



* Data as for Table I; in each crop year the first change calculated is for July–September (September–November in 1946, when futures trading was temporarily discontinued until late August on account of price controls), and the last price change, for March–May.

through the insurance premiums, and to pay also the overhead costs of writing policies and adjusting losses. Hedging, as we saw earlier, is not ordinarily done primarily for its insurance value, but because it is a logical consequence of the information on which the hedger acts (p. 325). The fact that business risks attending such hedging are very small is none the less a valued consequence of such hedging; and when the costs of hedging in the futures contract logically indicated are excessive, businessmen naturally consider the possibilities of obtaining at least the insurance values of hedging at a moderate cost. The principal insurance value of hedging wheat stocks in the Pacific Northwest is supplied about as well by Chicago futures as by Seattle futures.

This interpretation of hedging deserves empirical support. Is a

TABLE I.—SPOT AND FUTURES PRICES OF WHEAT AND TWO-MONTH PRICE CHANGES, JULY 1947 TO MAY 1948*
(cents per bushel)

Date	Chicago Futures ^a		Spot Prices		Two-Month Price Changes		
	Dec.	May	Kansas City ^b	Portland ^c	Chicago Futures	Kansas City	Portland
1947							
July 16	237	...	234	219
Aug. 16	237	...	231	222
Sept. 15	279	...	275	256	+42	+41	+37
Oct. 16	302	...	306	281	+64	+75	+59
Nov. 15	299	286	301	300	+19	+26	+44
Dec. 16	309	296	304	293	+07	-02	+12
1948							
Jan. 16	...	305	311	291	+18	+10	-09
Feb. 14	...	235	235	212	-62	-79	-81
Mar. 16	...	239	249	237	-66	-62	-54
Apr. 16	...	252	249	243	+17	+14	+31
May 17	...	244	240	235	+05	-09	-02

* Prices for that trading day nearest the middle of the month on which quotations are available in all three markets, rounded to the nearest cent.

^a Means of highest and lowest prices during the day, from Chicago *Journal of Commerce*.

^b Weighted average of reported spot sales of No. 2 Hard and Dark Hard Winter wheat, compiled by U. S. Department of Agriculture from Kansas City *Grain Market Review*.

^c Spot prices of No. 1 Soft White wheat, compiled by U. S. Department of Agriculture.

"poor" hedge reasonably comparable with insurance that covers losses above some stated minimum? Or is it more properly comparable with insurance covering only a *fraction* of the total loss; or with insurance carried with a company of uncertain financial status, that may turn out to be no insurance at all? The facts are well illustrated by Chart 1.

The meaning of the points plotted in the chart may be grasped readily by considering their relation to the illustrative data in Table I. The point, for example, that appears at the extreme lower left of each section of the chart, is plotted from the data for "two-month price changes" appearing in the table opposite "Feb. 14." These are price changes from December 16, 1947 to February 14, 1948. Over this two-month interval, the spot price at Portland fell 81 cents; that at Kansas City fell 79 cents; and the price of the Chicago May future fell 62 cents. Despite these severe price declines holders of wheat stocks of the indicated qualities at Portland and Kansas City, hedged in the Chicago future, would have lost only 19 and 17 cents per bushel, respectively.

Points on the diagonal line across the center of each section of the chart represents instances in which the spot and the futures prices

changed equally. Points to the left of this line represent instances in which the spot price fell more than the future price, or rose less. These were instances in which hedged stocks would have been carried at a loss, as in the specific case just considered. Conversely, points to the right of the diagonal represent instances in which a gain would have resulted from the carrying of hedged stocks. Nothing further need be said here about the way in which hedgers use futures quotations to judge in advance when the carrying of stocks is likely to prove profitable, but it is pertinent to note that Table I includes evidence that a hedger anywhere in the Middle West, at least, had reason to expect a loss if he carried stocks of wheat from December 16, 1947, to February 14, 1948. This prospect was indicated by the fact that on December 16 the price of the Chicago May future was 13 cents under the price of the December future.⁶⁰

Amounts of gain or loss from carrying hedged stocks of wheat are indicated directly in Chart 1 by the horizontal (or vertical) distances of the plotted points from the diagonal line. The scatter of the points is greater, and therefore gains and losses were greater, for Portland wheat than for Kansas City wheat, though perhaps not so much greater as some would have expected. But the important fact for present purposes is that the points in the chart cluster as closely around (or are no more widely dispersed around) the diagonal lines near their ends than near their midpoints. There is no evident tendency for gains and losses on hedged stocks to have been larger when price changes were large than when price changes were small. Hedgers take some risks even though they can estimate fairly well the prospective gain or loss from storage, and a good deal more risk on wheat stored in Portland and hedged in Chicago than on wheat stored in Kansas City and hedged in Chicago. But in either case the amount of risk is substantially *independent* of the amount of price change. Hedging limits the amount of risk in substantially the same sense that insurance covering losses above a stated amount limits risk.

In the light of these facts, it is understandable that many hedgers should prefer a "poor" hedge that is cheap to a more nearly perfect hedge that is relatively expensive. The tendency for most futures trading in any commodity to converge in some one exchange, and to concentrate in some one contract there, is explained. There is even an implied suggestion that trading in barley futures, for example, may have died out in the United States because grain dealers chose commonly to

⁶⁰ This relation reflected a current high premium on spot wheat over the May future, indicative of prospective declines in spot prices relative to the May future throughout the United States east of the Rocky Mountains, but not necessarily on the Pacific Coast.

hedge their barley stocks in corn futures, at low cost, in preference to hedging in the small and relatively inactive barley futures market, where the costs of hedging were relatively high. And the fact that merchants and processors make such choices does not necessarily indicate that they put a low estimate on the value of hedging. Their valuation of hedging must be judged from cases where the only choice open is to hedge in a market where hedging is expensive, or not to hedge at all. In such cases the common choice is to hedge, as is evidenced by the vitality of small futures markets that have no larger competitor.

VII. *Summary*

To summarize, we began with a definition of futures trading that related it intimately to other commodity transactions, and emphasized economy as its major distinguishing feature. A language problem, we found, has promoted a false idea of contrast between futures trading and other commodity trading. Looking at the bases of futures trading, we saw them to lie more in utilization of the advantages of futures markets by merchants and processors, for hedging, than in the desires of others to speculate.

Hedging we found to be not primarily a sort of insurance, nor usually undertaken in the expectation that spot and futures prices would rise or fall equally. It is a form of arbitrage, undertaken most commonly in expectation of a favorable change in the relation between spot and futures prices. The fact that risks are less with hedging than without is often a secondary consideration. The prevalent tendency to regard curtailment of business risks as the main service of futures markets has diverted attention from their probably more important service of promoting economically desirable adjustment of commodity stocks, thereby reducing price fluctuations. The argument for governmental stockpiling rests heavily on a consequent false appraisal of the causes of price fluctuations.

In further consideration of the subject of price fluctuations, we stated an ideal of behavior of a futures price that permits objective statistical tests, and put in one sentence the gist of conclusions arising from application of such tests to the intraday behavior of futures prices. The statement of conclusions was prefaced by some data on the operations of two professional traders which reveal characteristics far from those usually imagined to exist. Pending further research based on the stated concept of ideal price behavior, inferences on the reasonableness of the larger fluctuations of futures prices, beyond the limits of one trading session, must still rest largely on subjective judgment, but there is considerable evidence that these larger price fluctuations may usually re-

flect substantially accurate appraisals of changing economic facts that should be accompanied by such price changes.

Finally, we inquired into the causes of some puzzling characteristics of futures trading and found them explained by hedgers' responses to cost differentials associated with the "bivalence" of market price. The responses themselves depend largely on the fact that even a "poor" hedge affords good protection of the sort for which insurance is mainly needed. It is like casualty insurance covering losses above some stated minimum.