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SPECULATION ON HEDGING MARKETS

Though statistical evidence, accumulated first by the Grain Futures Administration, predecessor of the present Commodity Exchange Authority, long ago afforded proof to the contrary, it is still rather generally believed that futures markets are primarily speculative markets. They appear so on superficial observation, as the earth appears, from such observation, to be flat. A conspicuous recent result of reliance on superficial appearance was that an administrator of the CEA and a majority of members of the United States Congress were persuaded, mistakenly, that the onion futures market had attracted an excessive amount of speculation, supposedly requiring the prohibition of futures transactions in that commodity. The result was enactment of Public Law 85-839 prohibiting futures trading in onions.¹

In the present article I seek chiefly to put available official statistics of futures markets into such form as to make clear what they show regarding the relations of speculation and hedging on such markets. First, however, it is necessary to find a definition of *speculation* that can be used consistently and without confusion.

The commercial meaning of "speculation" was undoubtedly derived from earlier use of the verb *speculate* in the sense of *observe* (the meaning of its Latin root, *speculari*), hence *to try to see*, or *try to understand*. In that sense of the word, we speculate on the nature of the universe, on the reasons for a person's actions, or on the probable consequences of a given situation. The verb implies uncertainty, coupled with some reasonable basis for an opinion regarding the subject concerning which we speculate, or meditate. Presumably the present commercial use of the term originated from frequent references to speculation (in the sense of meditation) about future commercial events. In time "speculate" came to mean the *actions taken* on the basis of such meditation rather than the meditation itself.

Then someone, impressed by the hazards of commercial speculation, could

¹ That action, closing one economically useful market and implying an imminent danger of similar closing of other such markets, emphasizes a need for better and more widespread understanding of the economics of futures markets. In a previous article (23, p. 3), I reviewed evidence on the price effects of futures trading—evidence that directly contradicts what the congressional committees had been led to believe; and I promised there a subsequent discussion of reasons why the congressional committees interpreted as they did the evidence put before them. The reasons are not specific to the onion market, but general, influencing most people who are otherwise well informed, and producing misunderstanding and misjudgment of all futures markets. Only part of them can be considered here.

speak of a "speculative venture" and have people understand that by *speculative* he meant *risky*—a meaning far removed from the original meaning of *speculate*. "Steal" has taken on a similarly new meaning in the baseball expression, "steal a base."

Speculation, in the commercial sense, appears always to have been criticized by many people; the word seems always to have had a derogatory flavor. Such disapproval, arising in a society that has tended to honor the taking of risks in good causes, must be supposed to have rested on a prevalent belief that commercial speculation tends to be predatory rather than productive.

Economists and businessmen who have seen virtues in commercial speculation have often sought to define speculation as *economically necessary* risk-taking. Thus they have argued that a farmer speculates when he postpones sale of part of his crop for several months after harvest, in the hope of getting a higher price later. By the same argument, a manufacturer may be said to speculate when he contracts the purchase of supplies, well in advance of need for them, in the belief that he can buy more cheaply then than later. Such a definition of speculation amounts to defense by definition. As such, it has been ineffective, doing little or nothing to improve most people's opinions of speculation in general. The main result has been to introduce confusion concerning the meaning of the word. Economic discussion of speculation has thus reached conclusions that tend to be misleading in practical application, because it has considered one thing, and the conclusions are applied to something rather different that goes under the same name.

Scarcely anybody uses the word "speculation" consistently in the artificial sense of "economically necessary risk-taking," while nearly everybody uses it sometimes or always in another, commonly understood, sense. In ordinary usage, speculation in commodities means seeking profit from transactions undertaken especially for that purpose, and not in the normal course of conducting a business of producing, merchandising, or processing a commodity. This definition might be considered to include arbitrage, but in ordinary usage arbitrage is not counted as speculation. Many people are unaware of the existence of arbitrage, and so do not mean to include it as speculation, and people who recognize its existence ordinarily distinguish between speculation and arbitrage.

The distinction ordinarily drawn between speculation and investment in securities follows the same principle that is commonly followed in distinguishing between speculation and other dealings in commodities. Though investors often acquire and hold securities primarily in expectation of appreciation in "value," rather than for current income, this is not regarded as speculation so long as the operations are only those normal to the business of keeping funds invested prudently and profitably. It is more difficult in practice to draw a line between speculation and investment in securities than between speculation and other dealings in commodities, but the principle on which people ordinarily mean to draw the line is the same in both cases. It is that of distinguishing between obviously desirable or appropriate business activities, and activities that, if useful and desirable, do not always appear so on the surface.

By way of formal definition we may say that *speculation in commodities is*

the holding of a net long or net short position,² for gain, and not as a normal incident to operating a producing, merchandising, or processing business.

For our present purposes this definition of speculation, excluding from it all profit-seeking transactions normal to the conduct of production, merchandising, or processing, and excluding arbitrage, has three advantages. It conforms with the commonly understood meaning of *speculation*. It is a logical accompaniment of a good general definition of hedging (use of futures contracts as a *temporary substitute* for contracts intended to transfer ownership of a quantity of the commodity, in the normal course of business).³ And it accurately describes the principle underlying the classification used in those statistics of commodity futures, published by the CEA, that we shall be using.⁴

There has sometimes been discussion of the question whether speculation is significantly distinguishable from gambling. In the United States this question has often come before the courts, because men who have lost money at speculation in commodity futures, thereby incurring debts to brokers, have sought to avoid payment by claiming them to be gambling debts.

Gambling does indeed resemble speculation, and likewise resembles many business undertakings, in that all involve taking risks in the hope of financial gain. Moreover, a man *can* undertake speculation, or a business venture, in a purely gambling spirit. Similarly, a man firing a rifle goes through the same motions whether he is aiming at a target on a rifle range, at a deer, or at a man across the street. And there apparently are some people who can shoot at a man with as little feeling as at a practice target. It is nevertheless profitable for society to distinguish among different uses of a rifle, and among different uses of risk-taking for monetary gain. Nor do we have any real difficulty in drawing these distinctions when we reject sophistry and apply common sense. We call a man an entrepreneur when he takes risks in a clearly useful type of business venture; a gambler when he takes risks of a nature that clearly serve no substantially useful economic purpose; and a speculator when he takes risks of another sort, that

² This phrase excludes arbitrage, and also any other holdings of matching long and short positions, such as may arise from mere failure to promptly cancel out directly offsetting contracts on the books. I intentionally avoid specifying that the net position should be calculated for a single commodity. For some purposes holding of long soybean contracts, for example, against short contracts in soybean oil and soybean meal, in appropriate proportions, should be considered arbitrage (and classed, more specifically, as either hedging or spreading, according to whether or not the holder is a soybean crusher, and the holdings of a size appropriate to the size of his crushing business). On the other hand, when considering the relative amounts of speculation and of hedging in, for example, Minneapolis wheat futures, the Minneapolis end of spreads between Chicago and Minneapolis should be counted as speculation in Minneapolis. In short, the line between arbitrage and speculation needs to be drawn according to the purpose of the analysis or discussion involved, hence a general definition of speculation must allow latitude for drawing that line differently in different circumstances.

Hedgers often engage in spreading operations, and sometimes their spreads may well be classed as a special form of hedging, as in an example cited in footnote 19 below. Usually, however, the holding of matching futures contracts in different markets or different delivery months seems to me best classed as spreading even when it is done by a firm that engages also in hedging.

³ This definition, worded a bit differently, appeared first in 21, p. 560.

⁴ Until 1956 the Commodity Exchange Act, which the CEA seeks to follow in its statistical classification of futures contracts, was somewhat inconsistent with this principle, in that it failed to recognize anticipatory long hedging as true hedging. An amendment enacted July 24, 1956, recognized such hedging by processors and manufacturers as hedging, but implicitly leaves similar hedging by *dealers* to be classed as speculation. The small apparent inconsistency in definition that thus remains in the Act should perhaps be regarded, not as inconsistency with the principle, but as an expression of opinion that forward contracting of supplies by dealers is not "normal merchandising practice."

some people do not recognize as economically useful, though others regard them as highly useful.

The courts in the United States have tended to draw the line between speculation in futures and wagering according to the criterion of "intent to deliver." The adoption of this criterion by the courts seems to reflect an imperfect understanding of futures markets. The economic usefulness of futures contracts does not arise from their usability for merchandising, but mainly from their use for hedging. The courts can refuse to enforce gambling contracts in many states on the ground that such contracts are illegal, and in any state on the ground that such contracts are frivolous matters with which the courts refuse to concern themselves, as they would refuse to enforce the decisions of an umpire in a ball game. On the other hand, the courts seek to enforce futures contracts, and other contracts related to them, because futures markets are accepted as economically useful institutions. An economist would rather see the usefulness of futures markets affirmed in court on the basis of their true principal merits, rather than on the basis of a technical characteristic of the contracts that is necessary, but that, when emphasized, misrepresents the main function of such markets.

The choice of grounds on which courts in the United States have traditionally sustained futures contracts has had the unfortunate effect of hampering efforts of exchanges in the United States to control corners and squeezes. The exchanges have often felt compelled to countenance recognizably unreasonable demands for delivery, made for manipulative purposes, lest in the process of controlling manipulation they lose the court-recognized ground for distinguishing between economically useful contracts and economically useless wagers. In England, where the courts have relied on other criteria than intent to deliver, corners and squeezes have never presented a serious problem. No corner, and no squeeze of consequence, has ever been carried through on the Liverpool wheat futures market (20, pp. 137-38; 4, p. 104).

RELATIONSHIP BETWEEN SPECULATION AND HEDGING

The first published statement of the conclusion that speculation on a futures market responds to hedging needs, appeared in an article by H. S. Irwin⁵ (5) in 1935. Subsequently, further evidence was published by Hoffman (3, pp. 33-39) and by Schonberg (7, pp. 279-88). All of it showed that as commercially owned stocks of the commodity increased or decreased, tending to cause increase or decrease in the volume of short hedging contracts held against such stocks, speculative holdings of futures contracts tended to increase or decrease correspondingly.

Despite the published statements of this conclusion, and the steady appearance year by year of new statistics that always tended to confirm it and never

⁵ Irwin, then an economist in the Grain Futures Administration, subsequently made an historical study of the origins of futures markets in butter and eggs, and undertook a reinterpretation of historical information on the origins of grain futures (6). Both indicated that futures markets had grown out of business needs, or wishes, of the sort that hedging meets. One cannot say accurately that it grew out of a desire for a means of hedging, in the modern sense, because only a primitive concept of the usefulness of hedging could emerge until after hedging facilities came into use. Even now it often takes several years following the establishment of a new futures market for handlers of the commodity to learn to use the market effectively for hedging. Irwin's interpretation met such resistance at the time that the results of his study had to be published privately, but it can now be seen as certainly correct, at least in its main outlines.

contradicted it, the idea that speculation in futures depends on hedging gained little ground among either economists or members of the exchanges. In 1953 there occurred a striking demonstration of the continued adherence of exchange members to the old concept, and of the truth of Irwin's conclusion, published 18 years earlier, that speculation depends on hedging. In April and early May of 1953, flour mills with long hedges in Kansas City wheat futures (against unfilled flour orders) took substantial losses because soft wheat, unexpectedly drawn to Kansas City for delivery on futures contracts, depressed the price of the May future relative to prices of the hard wheats needed by mills to fill their flour orders. The millers promptly petitioned for a revision of the Kansas City futures contract to make it strictly a hard-wheat contract. It had always previously been so in effect, hedgers and speculators thought of it as such, and many members of the exchange had been surprised to learn that delivery of soft wheat was permitted by the contract.

The members of the exchange, however, seem to have been almost unanimous in the belief that the amount of futures business done on the exchange depended on attracting speculators, and the majority held also the common belief that speculators want a "broad" contract, allowing delivery of more than one class and grade of the commodity.⁶ So the exchange refused the plea of the millers for a revision of the contract terms. But in July and August millers took even larger losses, per bushel, on their long hedges, for the same reason as earlier, and this time the losses occurred on a great volume of such hedges, held against recently placed flour orders for milling from the new crop. These new losses caused most millers who had been hedging in Kansas City wheat futures to transfer their hedging business either to Minneapolis, where the hedge was in a hard-wheat contract, or to Chicago, where the hedges, though no more reliable than at Kansas City, could be placed and removed more economically.⁷ And speculators apparently deserted the market in about the same large proportion as did hedgers (22).

If the Kansas City exchange had persisted in rejecting the pleas of its principal hedgers, the wheat futures market there would very soon have joined the considerable list of such markets that have died because hedgers stopped using them. Mess pork and lard were among the commodities in which futures markets were established early at Chicago, and in the 1880's short rib sides were added to the list. Of these only lard remains, because development of mechanical refrigeration operated to so curtail the accumulation of stocks of cured pork products that hedging of them dwindled. New York City and St. Louis had important wheat futures markets at the beginning of the present century, but their business declined as changes in the wheat trade, and improved communications, reduced the special advantages of hedging in those markets rather than in the more economical Chicago market. Kansas City, Minneapolis, and Duluth held their hedging in competition with Chicago because their contracts were distinctive,

⁶ There is no valid evidence, so far as I am aware, that speculators do have such a preference, but the opinion that they do has, for some obscure reason, gained wide acceptance on the exchanges.

⁷ More economically because a hedger, wanting prompt execution of his orders, must expect ordinarily to buy at an "asked" price and sell at a "bid" price, and therefore, can obtain prompt execution at the lower cost in a "broad," active market, where bid and asked price are closer together than in a less active market.

applying to hard winter wheat,⁸ hard spring wheat, and durum wheat, respectively; but in the 1930's drought and rust damage so curtailed production of durum wheat that the Duluth market was discontinued for lack of enough hedging business to support it.⁹

Further evidence of the sort cited above might be added in great quantity,¹⁰ but without meeting the major obstacles to recognition of the significance of the evidence. These appear to me to be: (1) the existence of a great amount of evidence that *seems* to indicate that most speculation in futures occurs without any relation to hedging; (2) certain apparently reasonable grounds for doubt whether speculators have reliable means for appraising the hedging needs of a futures market, such as would be required for any close adjustment of the amount of speculation to the amount of hedging; and (3) certain shortcomings of the available statistics that have tended to render them unconvincing, except to people with a good deal of collateral information to aid in interpreting them, and considerable skill in reading the meaning of crude statistical evidence.

The prevalent opinion that much speculation in futures has no significant connection with hedging is a mistaken one that has arisen from a long-established habit of using an available crude indicator of the amount of speculation as though it were a direct and accurate measure of speculation. The only aspect of speculation that is readily observable is the *transaction* by which a speculator initiates or closes out a speculative venture. That is also the only aspect of speculation in futures concerning which any statistics were regularly published prior to July 1923 (10, p. 24).¹¹

But these readily observable transactions are only incidental to speculation, as starting and stopping are incidental to driving an automobile across town. In speculation, to pursue the analogy, a new driver takes the wheel at each stop, and each new driver is usually another speculator. But one may observe these changes of "drivers" without learning anything about the question whether most of the trips across town are made on behalf of hedgers. To learn how much speculation is connected with hedging it is necessary to find out what proportion of total speculative open contracts is needed to carry the hedging open contracts. The principal observed facts that have *seemed* to show that speculation in futures does not depend on hedging have been misleading; we need to study the statistics of open contracts in order to learn the extent of connection between hedging and speculation.

⁸ The Kansas City contract being distinctive, not by its terms but because, prior to 1953, the location of the market had effectively assured delivery of hard winter wheat on its futures contracts.

⁹ The course of business on the several wheat futures markets from 1921 through 1935 can be followed conveniently in 10, Tables 1 and 2, and for earlier years, in 16, V, pp. 36-40. No statistics of futures transactions in the cured pork products exists, so far as I know, but emergence of irregularity in the recording of price quotations (2) shows when business had fallen very low.

¹⁰ For example, the fluctuations from year to year in average volume of open contracts in wheat at Minneapolis reflect annual fluctuations in size of the spring-wheat crop of Minnesota and the Dakotas; fluctuations in open contracts at Duluth reflected variations in size of the durum crop; fluctuations at Kansas City reflect variations in size of the wheat crop of the Nebraska-Kansas-Oklahoma area. And examples such as the foregoing and those in the text might be cited for any commodity; it is only special familiarity with wheat production and marketing that has led me to pick examples from that commodity.

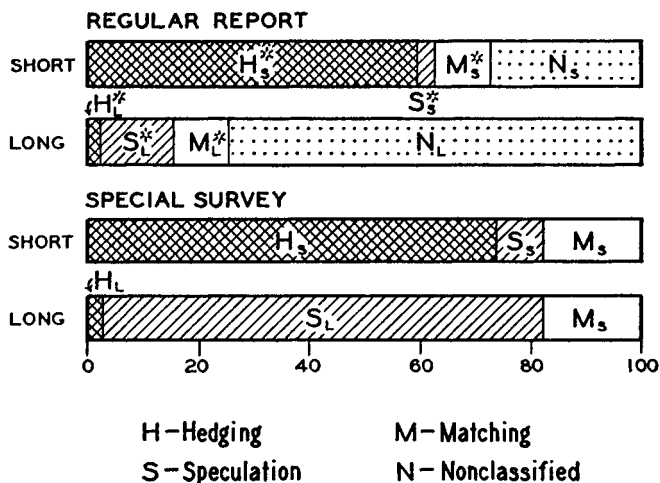
¹¹ The Grain Futures Administration then began publication of statistics of open contracts in grain futures, first in the form only of totals, later with a partial classification between speculative, hedging, and spreading contracts. The Federal Trade Commission subsequently published with discussion some special compilations of earlier data on open contracts (principally in 16, VII, pp. 124-36).

Let us defer until later the question whether there exists any reasonably reliable mechanism by which speculators might be led to undertake the holding of futures contracts mainly in response to the offering of such contracts by hedgers. What then, do the statistics of open contracts show regarding the degree of correspondence between amounts of hedging and of speculation in futures?

A principal obstacle to drawing conclusions from the statistics of open contracts is illustrated by Chart 1, which compares the evidence from two sorts of

CHART 1.—Comparison of Classifications of Open Futures Contracts According to Regular Reports and a Special Survey, Eggs, July 31, 1946*

(Per cent of total)



* Based on data in Table 1; the date, which is the only one for which a complete classification of open contracts for eggs is available, was about a month after the establishment of an all-time record volume of open contracts in eggs. Asterisks (*) designate incomplete data from regular reports; subscripts distinguish short and long contracts.

available statistics. Data for two additional commodities are shown in Table 1. The lower bars in the chart compare amounts of speculative contracts (S) and of hedging contracts (H), long and short (indicated by subscripts), for a date for which a complete classification of the open contracts in eggs is available. (M represents matching contracts, presumably arising largely from inter-option spreading, but partly from temporary failure to cancel out offsetting long and short contracts on the books). Such a complete classification of contracts has been published for only a few commodities and a few isolated dates—often dates on which some exceptional conditions existed in the market, rendering the data unrepresentative. The data for eggs, given for the only date for which a complete classification of open contracts has been published, is one on which total open contracts in eggs were near their all-time record level, reached about a month earlier.

The two upper bars in the chart show, for the same date, the sort of statistics of open contracts that are published regularly, as of the middle and end of each month, for all regulated commodities. In these regularly published statistics there is a large “nonclassified” category (N), which absorbed 28 per cent of the

total short egg contracts on this date, and 74 per cent of the long contracts. Looking at the major elements in the short and long contracts, we find only 81 per cent of the short hedging contracts, and only 17 per cent of the long speculative contracts, explicitly classified as such in the regular reports (percentages calculated from data in Table 1).

TABLE 1.—COMPARISON OF REGULARLY REPORTED CLASSIFICATION OF OPEN CONTRACTS WITH COMPLETE CLASSIFICATION, EGGS, COTTON AND WOOL TOPS, AVAILABLE DATES*

(Carlots; thousand bales; thousand pounds)

Class of contracts	Eggs July 31, 1946		Cotton Sept. 28, 1956		Wool tops Dec. 31, 1957	
	Long	Short	Long	Short	Long	Short
A. Regular Reports						
Hedging	225	6,203	873	670	1,690	4,290
Speculative	1,416	284	102	3	1,785	0
Matching ^a	1,035	1,035	220	220	205	205
Nonclassified	7,746	2,900	668	970	3,665	2,850
Total	10,422	10,422	1,863	1,863	7,345	7,345
B. Special Surveys						
Hedging	261	7,710	1,001	1,140	2,290	5,300
Speculative	8,333 ^b	884	268	130	3,385	375
Matching ^c	1,887	1,887	606	606	1,660	1,660
Total	10,481	10,481	1,875 ^d	1,876	7,335	7,335

* Data from U.S. Dept. Agr., *Commodity Futures Statistics* (1947, 1957, and 1958) and from reports on CEA special surveys for commodities and dates indicated.

^a Contracts explicitly classed as "spreading."

^b Includes 234 carlots reported without classification by foreign futures commission merchants.

^c Amounts long (short) that were offset by equal or greater amounts short (long) in individual accounts, not necessarily in different futures.

^d Discrepancy between long and short totals reflects minor error in compilation of survey data.

The data in the chart are fairly representative of the degrees to which short hedging and long speculation get explicitly classified in the regularly published statistics for most commodities. But for eggs they are highly unrepresentative. We shall see subsequently that, on the average during the last five years, only about 27 per cent (instead of 81 per cent) of total short hedging in eggs has been explicitly classified as such in the regular reports. With egg stocks exceptionally large on July 31, 1946, contract holdings by individual hedgers tended to be large, and so an exceptionally large proportion of the hedgers held contracts for 25 carlots or more in a single future—the amount that brought them under the administrative requirement for reporting the classification of their contract holdings.

Despite the large proportions of open contracts that remain unclassified in the regularly published official statistics, it is possible to break down the nonclassified category with a reasonable degree of reliability. The common practice hitherto has been to regard the nonclassified contracts as mainly small-scale speculative contracts and therefore to add them to the reported (large-scale) speculative contracts. This procedure, applied to the data in Table 1, results in the percentage

distribution of contracts between hedging, speculation, and spreading and other matching contracts, that is shown in section (A) of Table 2. Section (B) of the table shows the results of applying a simple estimation technique, described in an appendix below, to allocate nonclassified contracts more appropriately. Section (C) shows, for comparison, the correct distribution of contracts among the three categories, as revealed by special surveys made as of the dates for which data are shown.

TABLE 2.—COMPARISON OF RESULTS OF TWO ESTIMATION METHODS
FOR HANDLING NONCLASSIFIED FUTURES CONTRACTS*

(Per cent of all contracts)

Class of contracts	Eggs July 31, 1946		Cotton Sept. 28, 1956		Wool tops Dec. 31, 1957	
	Long	Short	Long	Short	Long	Short
A. Conventional Estimates from Regular Reports						
Hedging	2	60	47	36	23	58
Speculative	88	30	41	52	74	39
Matching	10	10	12	12	3	3
B. New Estimates from Regular Reports						
Hedging	3	73	61	50	30	75
Speculative	73	3	27	38	57	12
Matching	24	24	12	12	13	13
C. Special Surveys						
Hedging	2	74	54	61	31	72
Speculative	80	8	14	7	46	5
Matching	18	18	32	32	23	23

* Derived from Table 1; new estimates by procedure described in Technical Appendix.

The estimation procedure, it will be seen, has worked excellently in its apportionment of contracts to the hedging category. For eggs and wool tops the discrepancies exceed one percentage point only in the case of short hedging of wool tops, where the estimation procedure gave 75 per cent short hedging contracts as compared with a true value of 72 per cent. For cotton, the estimation procedure could not correct the false indication of the regular reports that there was nearly one-third more long hedging than short hedging (actually the amount of short hedging exceeded that of long hedging by over one-eighth), but the estimation procedure nevertheless gave nearly the correct total for the sum of the two sorts of hedging.

In its allocation of the remaining contracts between the categories of speculation and of spreading or other matching contracts, the estimation procedure resulted in understatement of the amounts of speculative contracts for eggs, and over-statement of the amounts of speculation in cotton and wool tops. But in all cases it produced estimates of the amounts of speculation that were closer to the truth, and usually much closer, than those obtained by merely treating all non-classified contracts as speculative. The false indication of the regular reports that

there was more long hedging than short hedging of cotton necessarily carried over into the estimates of speculative contracts, in the form of a false indication of more short speculation than long speculation, but for the other two commodities, as will be seen, the estimates produced an approximately correct indication of the relation between the amounts of long and of short speculation.

The procedure tested above on data for three commodities, for individual dates on which the reliability of the method can be checked against completely classified statistics of open contracts, has been used to derive the data in Table 3,

TABLE 3.—ESTIMATED AVERAGE DOLLAR VALUES OF SHORT HEDGING AND OF LONG SPECULATIVE OPEN CONTRACTS, RATIOS, AND SPECULATIVE INDEX, ELEVEN COMMODITIES, MOSTLY 1954/55–1958/59*

(Million dollars; ratios)

Commodity	Short hedging contracts			Hedging ratio ^c r_h	Estimated total long speculative contracts ^a S_L'	Speculative ratio ^a r_s'	Speculative index ^d T'
	Estimated total ^a H_s'	"Reported" (large scale) H_s^*	Reporting ratio ^b H_s'/H_s^*				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cotton	179.8	109.0	.61	.74	130.7	.73	1.27
Wheat	125.1	88.1	.70	.58	97.1	.78	1.22
Soybeans	102.6	57.9	.56	.52	92.7	.90	1.28
Corn	53.3	40.2	.75	.36	45.3	.85	1.16
Soybean oil	26.0	23.6	.90	.46	19.5	.75	1.14
Eggs	13.8	3.8	.27	.09	16.3	1.18	1.25
Wool tops	12.1	9.8	.81	.25	10.1	.84	1.07
Soybean meal ...	14.0	12.4	.89	.61	9.0	.65	1.16
Potatoes	3.3	2.2	.67	.30	3.5	1.05	1.27
Onions ^e	2.0	1.6	.79	.03	2.2	1.10	1.12
Bran ^f .....	.6	.6	.88	.66	.3	.53	1.12

* Five-year averages, 1954/55–1958/59, except as otherwise noted; computed from data in *Commodity Futures Statistics*, USDA Stat. Bull. No. 256, pp. 57–60, for quantities, and pp. 11–13, 24 (supplemented, for bran, by similar data from earlier issues) for average prices; cols. (2), (4), calculated directly from data in source. All calculations carried to more places than shown here.

^a See Technical Appendix below: "speculative ratio" is amount of long speculation divided by amount of short hedging, col. (5) ÷ col. (1).

^b Col. (2) ÷ col. (1); the reliability of the estimates in cols. (1) and (5) and of the speculative index, T , tends to be highest when this ratio is large.

^c Ratio of amount of long hedging to amount of short hedging, based on data for "reported" (large-scale) contracts.

^d Defined as unity plus the ratio, (short speculative contracts) ÷ (short hedging + long hedging contracts); calculated here as $T = (2r_h + r_s)/(1 + r_h)$.

^e Averages for 1955/56–1957/58; data not available earlier, and market conditions abnormal in 1958/59 owing to uncertain legal status.

^f Averages for 1949/50–1953/54; market shrank rapidly thereafter and was discontinued in 1957.

based on five-year averages (three years for onions) for eleven commodities.¹² In order to provide comparability between commodities, average amounts of open contracts are expressed in dollar values, obtained by multiplying averages

¹² Statistics of long hedging and of short speculation fail to appear explicitly in the table because space that they would occupy is needed for other information, but it should be noticed that estimates of long hedging and of short speculation, for each commodity, do appear *implicitly* in the table. The long hedging is directly calculable by multiplying the short hedging, H_s' , by the hedging ratio, r_h' ; and when that has been done, the short speculation is directly calculable because the total of short hedging plus short speculation must equal the total of long hedging plus long speculation ($H_s' + S_s' = H_L' + S_L'$).

in physical units for each commodity by the average price of the commodity for the period of the average.

Simple comparison of the figures in two columns of Table 3 shows that there has been at least a fairly close correspondence between the amounts of long speculation in these eleven commodities (col. 5) and the amounts of short hedging (col. 1). Either the amounts of speculation have been largely determined by the amounts of hedging in the several commodities, or the amounts of hedging have depended largely on the amounts of speculation. A little knowledge of the commodities makes it clear that it has been principally the amount of short hedging that has determined the amount of long speculation, rather than the other way around. For example, consider why bran is at the bottom of the list. The bran market was indeed regarded as a relatively unsatisfactory one for hedging, because it had too little speculation (the market closed November 5, 1957, for lack of enough business to warrant its continued maintenance). Given more speculation, it would doubtless have attracted more hedging than it did; but no amount of speculation in bran could have raised the amount of hedging in that market above, say, the amount of hedging shown for onions. There simply was not enough bran that might have been hedged. Bran is a minor byproduct of wheat milling, and is produced at a fairly regular rate, so that stocks are never more than a small fraction of the annual production.¹⁸

Wheat, next to the top of the list in terms of either amount of hedging or amount of speculation, had more than twice as much of both as did corn. That may seem inconsistent with the fact that the average value of the annual production of corn is about double the value of the wheat produced annually in the United States. Corn, however, is mainly kept on the farms where it is grown, and there used for feeding, whereas wheat moves quickly into commercial hands, where it tends to be hedged. So there has been in fact only about half as much corn as wheat, in terms of money value, to be hedged. Thus one might continue through the list and find all of the substantial differences in amounts of short hedging explained principally by differences in volume of stocks that holders might reasonably wish to hedge.

One may observe, nevertheless, some irregularity in the relationship between amounts of hedging and of speculation, as shown in Table 3. An extreme example appears just below the middle of the table: soybean meal, with slightly more

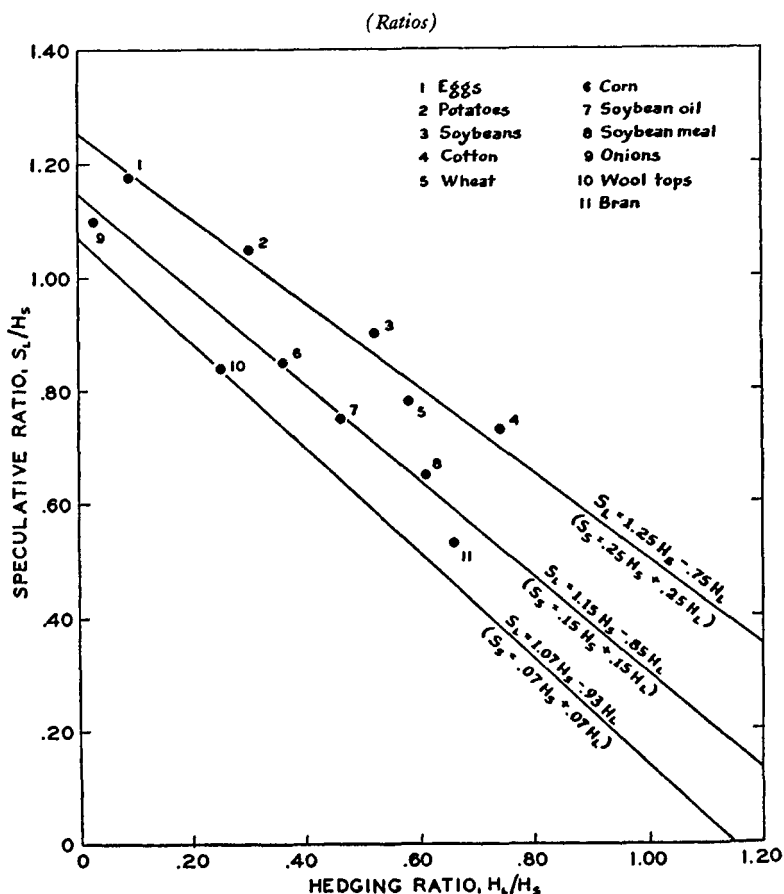
¹⁸ Because no large stocks of bran are ever accumulated, the maximum hedging potential of the bran futures market must be estimated on the basis of another, larger, source of reason for hedging in bran futures, namely the mills' problem of imperfect offset between unfilled flour orders and either wheat owned or long futures contracts held against them. The bran stocks hedged tend to be mainly those of bran in the form of wheat. Flour constitutes, by weight, only some 70-72 per cent of the product of wheat milling (for some data on variation in the conversion ratio, see 19, pp. 92-97). A calculation based on unfilled flour orders reported by the Millers National Federation for Sept. 30, 1950, a date of near maximum open contracts in the futures markets for bran and shorts (the two major milling byproducts) indicates a maximum hedging potential for mill byproducts about 19 times as great as the actual volume of open contracts in bran and shorts on the date. I am indebted to Roger W. Gray for this calculation.

But it must not be hastily assumed that there might have been nearly 20 times as much hedging of bran and shorts as there was on Sept. 30, 1950, if only there had been enough speculation in those markets to carry the hedging. Mills sell byproducts forward as well as flour, thus greatly reducing the occasion that they found for hedging byproducts. And, perhaps more important, risk reduction is not the primary reason for mill hedging in any case, but certain other advantages that are obtainable from hedging (see 21, pp. 549-54, 559) and byproduct hedging contributed little in those respects. So I judge that the amount of bran hedging might possibly have reached four or five times the volume that it did, if speculation had been attracted to the market in sufficient volume.

short hedging than eggs, had only 55 per cent as much long speculation as eggs. Such an irregularity in relationship, though inconsequential in comparisons between commodities that show numerous examples of one commodity with ten times as much speculation as another, and several commodities with between one hundred and several hundred times as much speculation as the commodity at the bottom of the list, are nevertheless worthy of notice. To bring these small irregularities into prominence for further study, the speculation-hedging ratio, called for brevity the "speculative ratio," is shown for each commodity in col. 6 of the table.

This speculative ratio is evidently rather closely related to the hedging ratio (col. 4), as should logically be expected. When there is much *long* hedging in a futures market, it serves in part to offset the short hedging, permitting the short hedging to be effectively carried by a smaller amount of long speculation than would be needed to carry an equal amount of short hedging with little long hedging. Chart 2 exhibits graphically the relationship between the speculative ratio and the hedging ratio.

CHART 2.—Average Relation of Amount of Long Speculation, S_L , to Amounts of Short Hedging, H_S , and of Long Hedging, H_L , for Eleven Commodities, Mostly 1954/55–1958/59*



* Data from Table 3.

Many economists, myself included, have tended at times to reason that the amount of long speculation needed in a futures market should depend on the *net* amount of hedging—short hedging minus long hedging. Students of the statistics, however, observed early that the amount of long speculation actually present in futures markets depends primarily on the total amount of short hedging rather than on the net short hedging position. It was evident from this that long hedging serves only in part to reduce the need for long speculation. The main reasons that this is so are easily seen when the nature of the long hedging is understood. Though long hedging commonly arises, directly or indirectly, as an expression of price judgment,¹⁴ it is not always an expression of such judgments, and often it expresses somewhat inexpert judgment. Consequently, most long hedging must commonly be absorbed initially by short speculation, instead of serving immediately to absorb simultaneously placed short hedging orders. Long hedges, moreover, tend individually to have a short life. The flour mill that has hedged a large flour order starts very soon, if not immediately, to buy the wheat for use in filling that order, and “lifts” its hedge piecemeal as it does so. The manufacturer of rolled oats who has bought oat futures as an anticipatory hedge, or the fruit-canner who has bought sugar futures similarly, does not wait long before making merchandising contracts for oats or sugar, and lifting the hedge as he does so.

The extent to which long hedging serves to balance short hedging is calculable (as will be explained presently) from the speculative index shown in the final column of Table 3. By calculating thus the amount of short hedging that, on average, was balanced by long hedging for each commodity,¹⁵ and subtracting that from the total amount of short hedging, we arrive at figures for amounts of short hedging that had to be carried by long speculation (Table 4). These are shown graphically in Chart 3, in comparison with the actual average amounts of long speculation in each commodity.

We thus find that each commodity appears to have had somewhat more speculation than was “needed” to carry the unbalanced short hedging in that commodity. Indeed, the speculative index itself is a direct measure of the amount of that “excess.” But at least a large part of what may be called technically an “excess” of speculation is *economically necessary*. This can be seen most readily if we imagine a futures market with *no* long hedging (a condition rather closely approached in the egg market). In such a situation the amount of long speculation *could* exactly equal the amount of short hedging; but it could do so only if there were also *no short speculation*. And that could happen in practice only if the price were so low that no speculator thought the price likely to go lower.

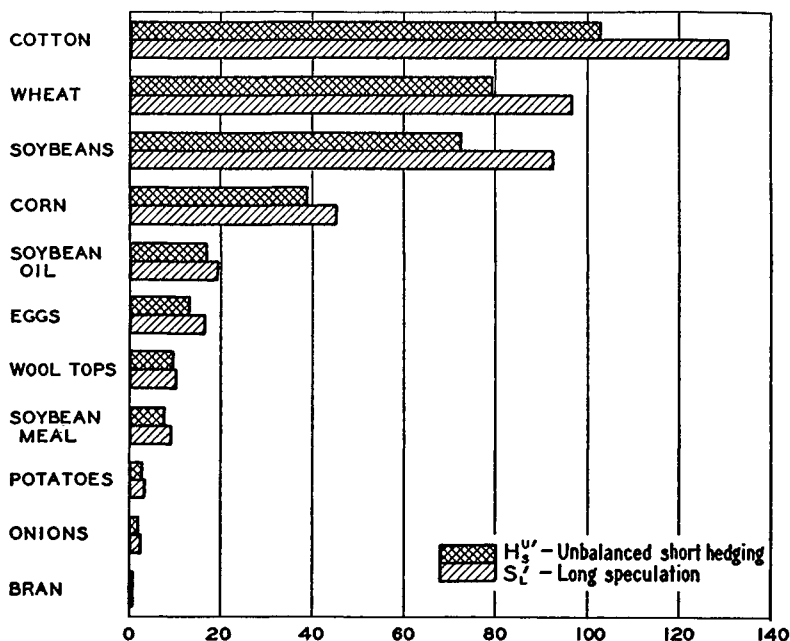
The uncertainties of price appraisal being what they are, a price so low that *no* speculator thought it likely to go lower would assuredly be too low. Any futures market must have more speculation than the minimum technically necessary to

¹⁴ Directly so in the case of anticipatory long hedging; indirectly so for such long hedging as is done by flour mills to offset large forward flour orders placed by bakers. The bakers try to place such orders when wheat, and therefore flour, appears to be priced relatively low.

¹⁵ The appropriate formula, as shown in the appendix, is $H_L^B = (2/T - 1)H_L$, where T is the speculative index; H_L is the amount of long hedging; and H_L^B is the amount of “balancing” long hedging, that serves to carry, or “balance,” an equal amount of short hedging. The reader may be helped by referring at this point to Chart 7, p. 207, which illustrates how the amount of balancing between long and short hedging changes as T changes.

CHART 3.—Comparison of Estimated Average Dollar Values of Unbalanced Short Hedging and Long Speculative Open Contracts, Eleven Commodities, Mostly 1954/55–1958/59*

(Million dollars)



* Data from Table 4.

TABLE 4.—ESTIMATED AVERAGE DOLLAR VALUES OF LONG HEDGING, BALANCED AND UNBALANCED SHORT HEDGING, AND LONG SPECULATIVE OPEN CONTRACTS, ELEVEN COMMODITIES, MOSTLY 1954/55–1958/59*

(Million dollars)

Commodity	Long hedging H_L'	Short Hedging			Long speculation S_L'
		Total H_S'	Bal- anced ^a H_B^B'	Unbal- anced ^b H_B^U'	
Cotton	132.5	179.8	76.8	103.0	130.7
Wheat	72.2	125.1	45.8	79.3	97.1
Soybeans	52.9	102.6	30.0	72.6	92.7
Corn	19.4	53.3	14.1	39.1	45.3
Soybean oil	11.9	26.0	8.9	17.1	19.5
Eggs	1.2	13.8	.7	13.1	16.3
Wool tops	3.0	12.1	2.6	9.5	10.1
Soybean meal	8.6	14.0	6.2	7.8	9.0
Potatoes	1.0	3.3	.6	2.8	3.5
Onions .....	.1	2.0	^c	2.0	2.2
Bran .....	.4	.6	.3	.3	.3

* Data as for Table 3, and partly from it.

^a Equal amounts long as well as short; computed as $(2/T - 1) H_L'$.

^b Estimated total short hedging (Table 3) minus balanced short hedging; occasional discrepancy in final digit arises from rounding figures calculated to more places than are shown here.

^c Less than 0.05.

carry the hedging, else it will be one in which heavy short hedging causes excessive price depression. How much speculation, beyond an absolute minimum, is needed depends on several circumstances that will be considered presently.

THE SPECULATIVE INDEX AND ITS USE

The speculative index, mentioned above and used in calculation of the amounts of unbalanced short hedging for Chart 3, rests on a simple basic concept that would be most easily applied to a market with no long hedging. In such a case, closely approximated in the egg futures market, the speculative index would be simply the ratio of the amount of long speculation to the amount of short hedging. In symbols, the speculative index would then be given by the formula,

$$T = \frac{S_L}{H_s} = 1 + \frac{S_s}{H_s} \quad (H_L = 0),$$

where the parenthetical remark at the right is a reminder of the assumption made as a basis for writing the formula.

If there is a purely logical basis for deducing how to write the formula for the speculative index for markets *with* long hedging, it has escaped me. But it can be shown (see the Technical Appendix below) that the data in Chart 2 reveal how the speculative index should be calculated for markets with long hedging; the previous formulas need to be modified only as follows:

$$T = \frac{S_L + 2H_L}{H_s + H_L} = 1 + \frac{S_s}{H_s + H_L} \quad (H_s \geq H_L).$$

Application of this formula, as is indicated by the statement in parentheses, is restricted to conditions in which the amount of short hedging exceeds or equals the amount of long hedging. In the reverse condition, which occurs occasionally in some markets, the formula needs only to be rewritten with subscripts changed, L for s and s for L.

Chart 4 illustrates, for two contrasting commodities, the principles involved in calculation of the speculative index according to the foregoing formula. The data for eggs show very little long hedging, and therefore nearly all of the short hedging must be carried by long speculation. In the data for eggs, the effects of long hedging are inconsequential because there was so little of it.

The data for cotton, however, with nearly four times as much long hedging as there was long speculation, present a situation in which seven-ninths of the short hedging was balanced by long hedging,¹⁶ leaving only two-ninths of the short hedging to be carried by long speculation. And in the cotton market at that time, the greater part of the short speculation was serving to carry a part (one-eighth) of the long hedging, leaving only a small amount of short speculation to be balanced by long speculation.¹⁷

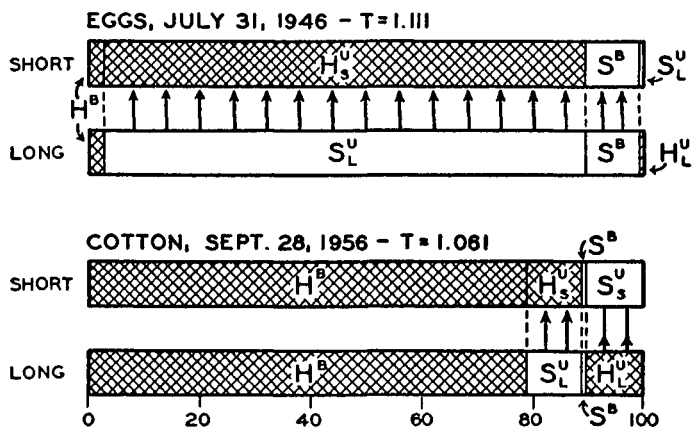
When we start thus with a definition of the speculative index, and proceed

¹⁶ The formula for calculating the amounts of hedging that balance each other, as shown in the appendix, is $H^B = (2/T - 1)H_L$, assuming $H_s > H_L$. For the data on cotton in Chart 4, $T = 1.061$.

¹⁷ The amounts of balancing speculation are given by the formula, $S^B = (1 - 1/T)S_L$.

CHART 4.—Illustrations of Meaning of Speculative Index in Terms of Market Functions*

(Per cent of hedging plus speculative contracts)



* Based on data from special surveys, Table 1; the quantities of hedging and of speculation, and the speculative indexes, are therefore accurately known, except as some contracts may have been incorrectly classified.

to calculate the amounts of hedging and of speculation that balance each other, and the amounts of speculation, both long and short, that serve directly to carry hedging, as seems to me necessary in a nontechnical explanation, we seem to have omitted a step in the reasoning. By what justification do we calculate amounts of balancing of hedging from a speculative index? The answer is that the balancing of mathematically determined parts of both speculation and of hedging is implicit in our second formula for the speculative index. When we used the statistical data of Chart 2 to derive a general formula for the speculative index—one not restricted to application in the absence of long hedging—we in fact determined empirically, from statistics for actual markets, the extent to which long hedging *does* balance short hedging and the extent to which short speculation has to be balanced by long speculation. It was lack of knowledge of these facts that prevented our writing, initially, a formula applicable in the presence of long hedging, and the statistical data supplied that information, in the guise of a general formula for the speculative index.

We need next to test the validity of the formula for the speculative index. For that purpose, the accuracy of the mathematics can here be taken for granted, but the adequacy of the data used cannot. Does the formula derived from the data give sensible results, in reasonable agreement with what is known otherwise about the eleven markets for which we have average values of their speculative index?

In order to appraise the reasonableness of the average values of the speculative index, as shown for eleven commodities in Table 3 and graphically in Chart 5, we need to review the major characteristics of the futures markets for those eleven commodities. The commodities were selected from among 21 for which the necessary statistics are available,¹⁸ with a view to obtaining adequate representa-

¹⁸ The number is 25 if one includes barley, rice, tallow, and middlings, which have been dealt in on futures markets only sporadically and on a very small scale since the war.

tion, within a list of moderate length, of all major different sorts of market conditions.

The present "big three" among futures markets—cotton, wheat, and soybeans—should of course be included. Addition of corn, which ranks next in size, provides, with wheat, enough representation of grains in the list. Soybean oil and soybean meal differ from all the other commodities in the list except bran and wool tops (both included for a different reason) in that they are processed products rather than primary products; and listing them along with soybeans includes the sole existing example of a group of futures markets that deal in a primary product and in all of its major derivatives.¹⁹

None of the foregoing commodities is used directly for human consumption, so I add eggs, potatoes, and onions to represent consumer goods in the list of commodities. Their special market characteristic is that, because they are not processed on a large scale, there is relatively little long hedging of these commodities. I take three such commodities in order to include among them a fairly mature futures market, eggs (established in 1922), along with the newcomers, potatoes and onions (1941 and 1942, respectively). Other relatively young markets in the list are soybeans (1936), soybean oil (1940), and soybean meal (1940).²⁰ The most noteworthy special characteristic likely to be present in a young futures market is a tendency for short hedging to be done selectively, according to the price expectations of potential hedgers. Dealers in such a commodity tend to persist for a time in making their own appraisals of price prospects, and hence to hedge stocks only when they expect a price decline, rather than to hedge routinely.

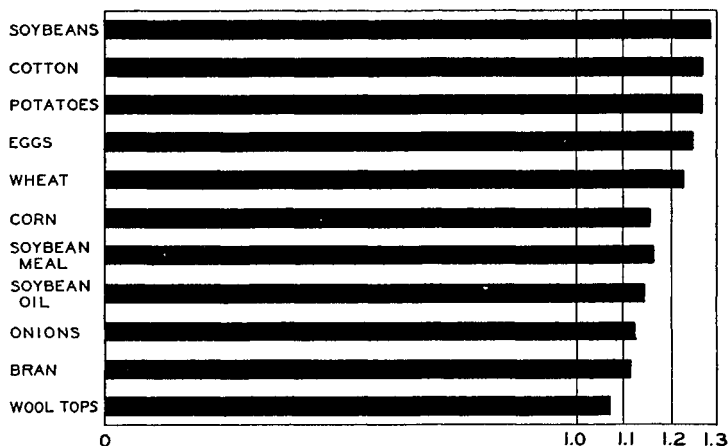
Finally, I add to the list two commodities whose futures markets appear to have been struggling against a handicap of neglect by speculators—wool tops struggling successfully, and bran, unsuccessfully. The futures market for the latter commodity, discontinued in 1957, may be truly an example of a market that died for lack of enough speculation rather than for lack of enough hedging to keep it going. The most thorough discussion of the early history of any futures market that has been published is Stewart's study of the wool top futures market (8).

Because the values of the speculative index shown graphically in Chart 5 have been derived from statistics in which open contracts have been only incompletely classified (as speculative, hedging or matching contracts), it will be necessary to keep in mind that the values shown may be more or less inaccurate. Moreover, the values obtained are dependent on the statutory definition of hedging, which has not entirely corresponded, especially prior to August 1956, with what businessmen regard as hedging.

The principal economic circumstances that tend to influence the value of the

¹⁹ Emergence of this condition led to the emergence of a new and unique sort of hedging. Soybean crushers often "hedge their processing margins," either by hedging soybean stocks in short futures contracts for soybean oil and soybean meal, in appropriate proportions, or by acquiring long soybean contracts, before stocks of beans have been accumulated, and simultaneously "selling" appropriate amounts of oil and meal contracts (1, pp. 23, 24).

²⁰ These are dates of the beginning of successful attempts to establish a futures market in each commodity. In at least one instance (potatoes) there was an earlier, but unsuccessful, attempt (18, pp. 1, 2). Owing partly to the effects of price controls established during the war, and continued for a time afterward, none of the futures markets established in 1936 or subsequently attracted a large volume of either hedging or speculative open contracts until about 1949, roughly a decade ago.

CHART 5.—Five-year Average Speculative Indexes, T' , for Eleven Commodities*

* Three-year average for onions; data from Table 2. The minimum possible value of the index is $T' = 1.0$.

With one exception, the values shown above appear reasonable in the light of other information about the markets; the index for bran, however, is too high, owing to official classification of anticipatory long hedging as speculation (see text).

speculative index for a commodity are: (1) degree of speculative "interest" in a commodity; and (2) quality of the knowledge and ability of the speculators participating in a market. A third circumstance that may appreciably influence the speculative index is the quality of the price judgments behind the long hedging that enters a market.

Variation in degree of interest in different commodities on the part of skilled speculators presumably occurs principally in the form of a tendency to avoid certain commodities. Skilled speculators shift their attention from one commodity to another with considerable freedom, according to the opportunities that they find in them for speculative profit. By thus shifting from one commodity to another, according to circumstances, they tend to equalize profit opportunities among markets. But certain circumstances can lead speculators to avoid dealing in particular commodities. A commodity that is dealt in only on an obscure market, from which quotations are not widely available, tends to get limited speculative attention. High commission rates, which tend to be necessary in a small market, also discourage speculative use of a market. And informed speculators tend to avoid dealing in a commodity whose price is subject to a substantial degree of control to their disadvantage.²¹

Contrary to an opinion that is sometimes expressed, degree of price variability does not, by itself, appreciably affect speculative interest in a commodity. A

²¹ This consideration operates to prevent the existence of futures markets in some commodities, but is rarely of importance, so far as I know, in restricting speculation in commodities for which such a market now exists. Belief that the price was subject to a degree of producer control led the Chicago Mercantile Exchange, a few years ago, to reject a proposal for establishment of a futures market in concentrated orange juice, a commodity for which producers desired hedging facilities.

speculator simply deals in larger quantities if price variations tend to be narrow than if they tend to be wide.

Unskilled spectators tend to be attracted particularly to the more prominent commodities. And because skilled speculators make profits at the expense of unskilled speculators, as well as by providing a desired service to hedgers, the presence of unskilled speculation in a commodity tends to add to the amount of skilled speculation in that commodity. Thus skilled speculation restrains the vagaries of price movement that unskilled speculation tends to produce, in the same way that it sharply restricts the influence of hedging pressure on a market.

The main variations in the speculative index between commodities that should be expected are, therefore, particularly low values of the index for some commodities that, for one reason or another, have attracted relatively little speculation, and rather high values of the speculative index for those commodities that attract a substantial amount of unskilled speculation. If long hedging in some commodities arises largely from particularly well informed forward buying by processors and manufacturers, either in the form of anticipatory long hedging, or in the form of advance orders which in turn are hedged, such long hedging will tend to partially serve the market function of skilled speculation, and thus make the speculative index of the market a fairly low one.

In the light of these considerations, one should expect the speculative indexes for soybeans, cotton, and wheat to be fairly high, as they are; and it may well be true, as the speculative index for wheat suggests, that that commodity no longer has as much special attraction to unskilled speculators as it used to. The speculative indexes for corn, soybean meal, and soybean oil, falling near the middle of the observed range of speculative indexes, are about as should be expected. And wool tops, with the lowest speculative index, was picked for inclusion in this list of commodities in the belief that it is a commodity with a relative scarcity of speculation.

The speculative indexes for potatoes and eggs are higher, in relation to other commodities, than I expected them to be, but my expectations did not take into account the fact that these are the leading commodities on the New York and the Chicago Mercantile Exchanges, respectively. As such, they would tend especially to attract the attention of such unskilled speculators as do business on those exchanges. Because the amount of hedging and total speculation in those commodities is small (Table 4), a small amount of unskilled speculation in potatoes and eggs can represent as large a *proportion* of total speculation in those commodities as occurs in cotton, wheat, and soybeans.

In the case of bran, it seems clear that the speculative index is distorted upward by a peculiarity of the classification of open contracts. The CEA seeks to have contracts classified according to the statutory definition of hedging, and it was only by amendment of the Commodity Exchange Act, approved July 24, 1956, that anticipatory hedging by processors and manufacturers was legally recognized as hedging rather than speculation (17). The data for bran, which had an exceptionally large proportion of anticipatory long hedging, all applies to a time when such hedging, if classed in accordance with the relevant statute, would have been listed as speculation. The data for the other commodities cover years during most of which anticipatory long hedging was legally recognized as

hedging. If open contracts in bran had been classed according to the present statutory definition of hedging, bran might well have been found to have the lowest speculative index of all.

Potatoes, eggs, and onions, being primarily consumer goods, have little anticipatory hedging by processors and manufacturers, but data from CEA special surveys for potatoes and onions show a large amount of long "speculation," as it is classed, by dealers. A large fraction of the long contracts held by dealers in these commodities appears classifiable, by business standards and on economic grounds, as anticipatory hedging by dealers. If a dealer with storage facilities in the country accumulates stocks of potatoes or onions while growers are selling heavily just after harvest, that is not regarded as speculation, by business standards. If a terminal-market dealer, lacking economical storage facilities, makes contracts directly with country dealers for purchase of potatoes or onions, thus sharing the burden of stock-carrying, that is no more speculative than the holding of stocks by a country dealer. If then, given a futures market, terminal-market dealers accumulate long futures contracts merely as a convenient temporary substitute for making purchase contracts directly with country dealers, is the holding of those futures contracts any more speculative than the holding of contracts directly with country dealers? If long futures contracts held by dealers, in amounts appropriate to normal operation of the business of such dealers, had been classed as hedging contracts, potatoes and onions would have had somewhat lower speculative indexes than those shown in the accompanying chart.²²

The one complete CEA special survey for eggs that is available gives evidence of no large amount of anticipatory long hedging by dealers in eggs. This is reasonably to be expected, because eggs are held in cold storage, mainly in the larger cities, and the dealers there can accumulate such stocks as they wish in their own hands, instead of relying on purchase contracts with country dealers, or on anticipatory long hedging. There is consequently no reason to suppose that the speculative index for eggs is appreciably distorted upward by classification as speculative of futures contracts regarded, from a business standpoint, as anticipatory hedging.²³

²² According to the classifications of open contracts by occupation of the holder, as given in CEA reports on special surveys, onions appear to have had a good deal more anticipatory long hedging than was classed as speculation than did potatoes, and much more than eggs. Taking the onion data for October 31, 1956, as classified between speculation and hedging by the CEA (14, p. 5), and eliminating matching contracts, the value of the speculative index for onions on that date was

$$T = 1 + \frac{S_S}{H_S + H_L} = 1 + \frac{587}{2979} = 1.197.$$

But of the long contracts classed as speculative, 2,024 carlots were reported as held by persons or firms concerned with the growing, marketing or processing of onions (14, p. 12). Of these, some 200 carlots were probably matched by offsetting short contracts in individual accounts, and I judge it possible that 1,500 carlots of the remainder might have been classifiable, on business standards, as anticipatory long hedging. Shifting the classification of 1,500 carlots from long speculative to long hedging, however, would reduce the speculative index only to $T = 1 + 587/4479 = 1.131$. This is not a suspiciously low value of the speculative index for a date of near-maximum short hedging, but a fairly high value.

²³ The general outcome of the foregoing appraisal of average values of the speculative index for eleven commodities is rather different from what I expected when I undertook it. The tests of reliability of the estimation procedure made for special survey dates (Table 2) had led me to expect that some average values of the speculative index derived by that procedure would have to be judged appreciably in error, owing to inability of the estimation procedure to cope adequately with the short-

Having found that a five-year average speculative index of about 1.15 appears to characterize futures markets that have neither a peculiar shortage of speculation, nor any substantial amount of particularly unskilled speculation, we have in the speculative indexes a basis for estimating the proportion of unskilled speculation in, say, the soybean market, which is the one with the highest speculative index, namely 1.28. On the reasonable supposition that the amount of relatively skilled speculation needed to satisfactorily "carry," or balance, a given amount of unskilled speculation, is the same as the amount of skilled speculation necessary to carry a given amount of hedging, the problem is a simple one in arithmetic. Subtracting 1.15 from 1.28, dividing by 1.28, and converting to a percentage, we arrive at the conclusion that about 10 per cent of the speculation in the soybean market was sufficiently unskilled that it had to be offset, like hedging, by better-informed and more skillful speculation.

CONTINUOUS RESPONSE OF SPECULATION TO HEDGING

Next we should examine the degree to which speculation responds to the continuously changing needs for hedge-carrying in a given market. For that purpose I take the wheat market, which is the one in which I am best acquainted with hedging operations and can interpret changes in short and long hedging most reliably.

The available data permit following the course of hedging and speculation, not quite week by week, but as of the middle and end of each month. They are shown in this detail, for three years, in Charts 6 and 7, and as of the middle of each month in Table 5. The second of the two charts serves primarily as an aid to interpreting the first. In Chart 6 interest focusses especially on the course of long speculation, which has to support all of the stock-carrying short hedging that is not balanced by long hedging. Therefore Chart 6 is drawn with the data on long speculation (long open contracts) plotted upward from the base line, and short speculation plotted downward. Short hedging is therefore plotted upward, for ready comparison with the long speculation, and long hedging plotted downward from the base line, for comparison with the short speculation. The speculative index is plotted to a scale with $T = 1.0$, the minimum possible value of the index, at the base line used for the other data.

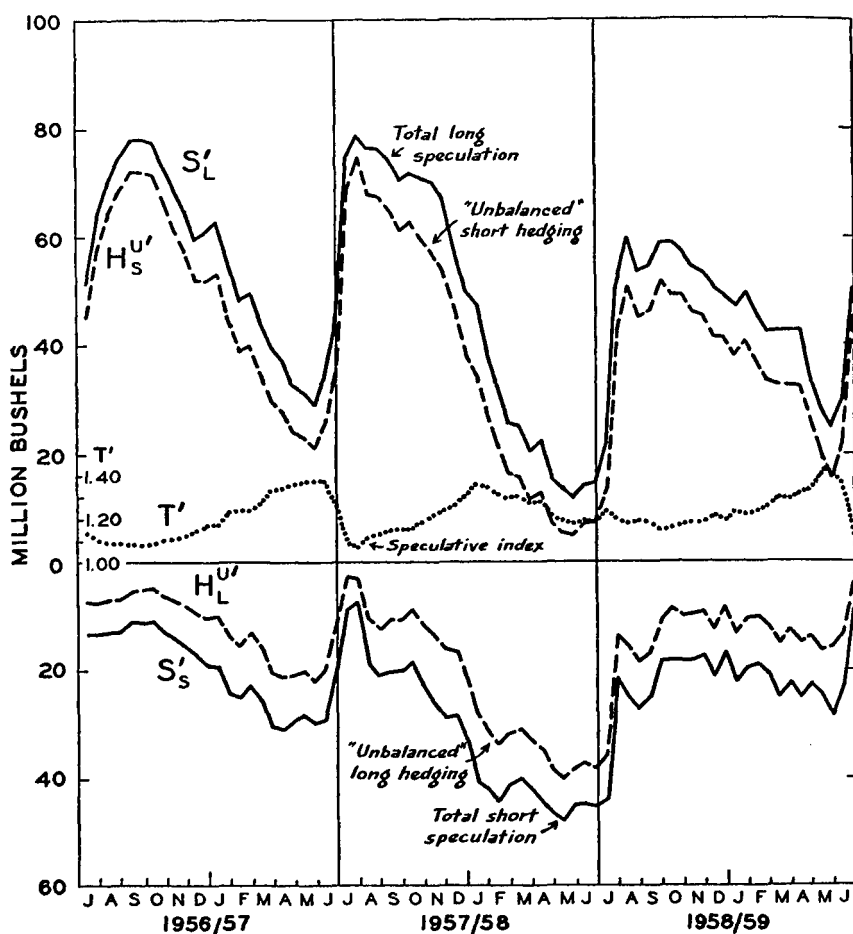
Chart 7, which shows only hedging data, in comparison again with the speculative index, needs to have hedging plotted as in the previous chart, hence short hedging is plotted upward and long hedging downward, though it would seem more logical to show them otherwise if the chart were not merely a supplement to the previous one. It shows the totals of short and of long hedging, and the portions of each that balance. The difference between the balancing portions of the two sorts of hedging and the total of each, is the "unbalanced" short and long hedging of the previous chart.

The extent to which long hedging balances short hedging (or, when long

comings of the original data. But I find myself unable to say confidently that the calculated average value of the speculative index is appreciably in error for any commodity except bran, and the error there seems attributable to faulty classification of the contracts classified, not to incompleteness of the official classification. Perhaps those characteristics of the data that produced clear imperfections of the estimates on individual dates are peculiarities that tend to cancel out in long-period averages.

CHART 6.—Changes, Semi-monthly, in Amounts of Speculative and of Unbalanced Hedging Contracts, Long and Short, for Wheat, June 1956–July 1959*

(Million bushels)



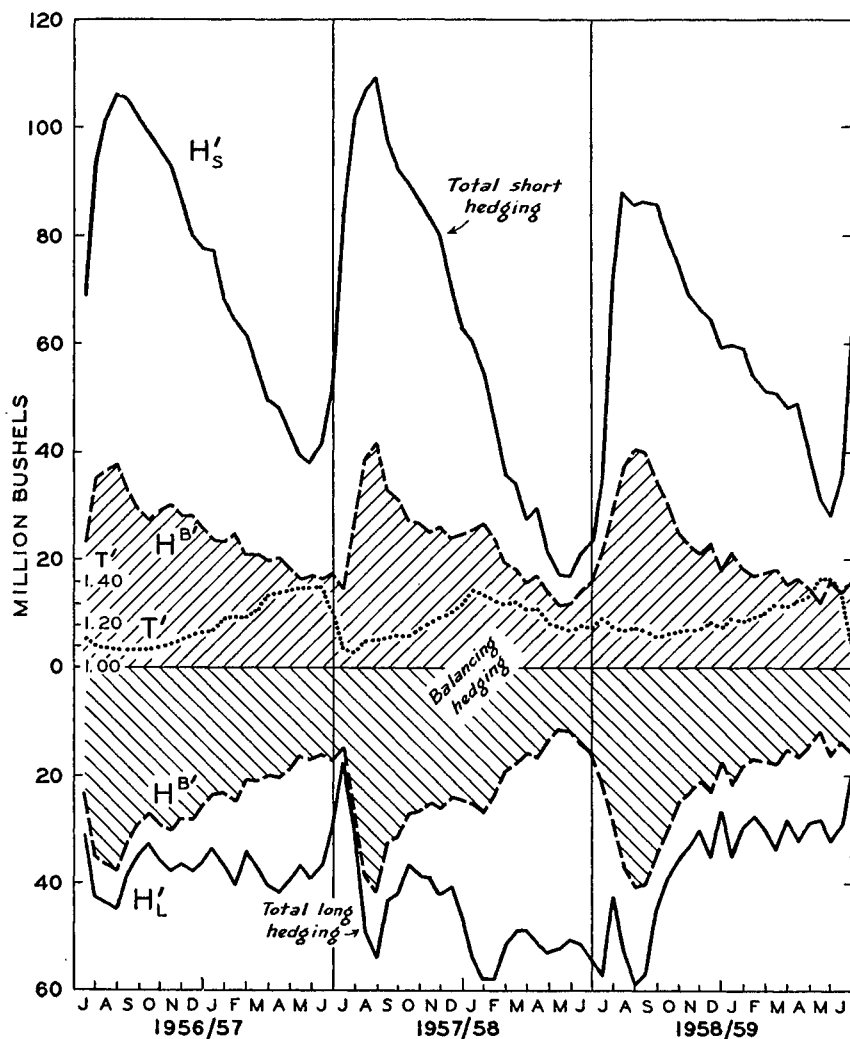
* Data from Table 5 and a like manuscript table including month-end statistics.

The total of long speculative open contracts in wheat during these three years exceeded the amount of "unbalanced" short hedging (see next chart) by a nearly constant 8 to 10 million bushels except for a bulge that carried it to 12.8 million on November 30, 1957. "Unbalanced" long hedging was carried by short speculation with the same margin of surplus as for long speculation. The speculative index (T') is close to unity when there is little short speculation relative to the amount of long speculation, as it normally is when hedging is heavy, and increases when either the amount of short speculation increases or the amount of long speculation decreases. (When hedging is net long, as during January–June 1958, speculation must be net short, and the formula for the speculative index is altered accordingly.)

hedging exceeds short, the extent to which short hedging balances the long) depends both on the amount of long (or short) hedging and on the speculative index, as can readily be seen from the chart. At those times when the amount of short hedging is so large as to strain the carrying capacity of speculation in a market, the price at which hedged stocks will be carried depends relatively heavily

CHART 7.—Changes, Semi-monthly, in Amounts of Hedging Contracts, Long and Short, and in Balancing Portions of Hedging, Wheat, June 1956–July 1959*

(Million bushels)



* Data as for Chart 6.

When the pressure of short hedging on a futures market is heavy, requiring a great amount of long speculation to carry it, the speculative index tends to fall close to unity. When it does so, most of the long hedging in the market serves to balance an equal amount of short hedging, thus decreasing the amount of long speculation needed. The amount of short hedging of wheat follows a smooth course, corresponding closely with the volume of commercial stocks to be hedged. The amount of long hedging, on the other hand, tends to change erratically, under the influence of spurts of buying, or the withdrawal of buying, by certain handlers of the commodity (in wheat, chiefly bakers and exporters). Unusual behavior in such buying accounts for the abnormal course of the speculative index for wheat during the latter half of 1957/58.

on the amount of long hedging present to aid in carrying the short hedging. At such times, a large fraction of the long hedging—up to 89 per cent in these data (July 31, 1957)—serves to directly balance an equal amount of short hedging. At

TABLE 5.—ESTIMATED TOTAL AMOUNTS OF LONG AND SHORT HEDGING AND SPECULATION, AND OF BALANCED AND UNBALANCED HEDGING, AND SPECULATIVE INDEX, WHEAT, MONTHLY, JULY 1956-JUNE 1959*

(Million bushels; ratio)

Date	Hedging		Speculation		Speculative index T'	Balanced hedging ^a HB'	Unbalanced hedging	
	Long H _L '	Short H _S '	Long S _L '	Short S _S '			Long H _L U'	Short H _S U'
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1956								
July 15	30.7	68.5	51.4	13.6	1.137	23.3	7.4	45.2
Aug. 15	43.8	100.8	70.0	13.0	1.090	36.6	7.2	64.2
Sept. 15	38.5	104.8	77.8	11.5	1.081	32.7	5.8	72.1
Oct. 15	32.4	98.8	77.7	11.2	1.085	27.3	5.1	71.5
Nov. 15	37.5	91.9	68.5	14.1	1.109	30.1	7.4	61.8
Dec. 15	37.9	80.1	59.6	17.4	1.147	28.2	9.7	51.9
1957								
Jan. 15	33.7	77.0	62.8	19.4	1.175	23.6	10.1	53.4
Feb. 15	40.3	63.8	48.6	25.0	1.241	24.6	15.7	39.2
Mar. 15	36.8	55.7	44.4	25.5	1.276	20.9	15.9	34.8
Apr. 15	41.9	48.2	37.5	31.2	1.346	20.4	21.5	27.8
May 15	36.4	39.5	31.5	28.4	1.374	16.6	19.8	22.9
Jun. 15	36.4	41.3	34.3	29.4	1.378	16.4	20.0	24.9
July 15	17.8	83.5	74.7	9.0	1.089	14.9	2.9	68.6
Aug. 15	49.2	106.6	76.4	19.0	1.122	38.5	10.7	68.1
Sept. 15	43.7	97.6	74.3	20.4	1.144	32.7	10.9	64.9
Oct. 15	36.4	89.7	71.8	18.5	1.147	27.1	9.3	62.6
Nov. 15	38.7	82.6	70.0	26.1	1.215	25.0	13.7	57.6
Dec. 15	40.4	69.5	57.6	28.5	1.259	23.8	16.6	45.7
1958								
Jan. 15	53.4	60.1	47.5	40.7	1.358	25.3	28.1	34.8
Feb. 15	57.8	45.6	32.1	44.3	1.310	24.0	33.8	21.6
Mar. 15	49.1	33.9	24.9	40.1	1.300	18.2	30.9	15.7
Apr. 15	51.4	29.6	22.4	44.2	1.277	16.8	34.6	12.8
May 15	52.0	17.3	13.4	48.1	1.193	11.7	40.3	5.6
Jun. 15	51.5	20.7	14.0	44.8	1.194	14.0	37.5	6.7
July 15	57.4	35.1	21.8	44.1	1.236	27.0	35.7	13.4
Aug. 15	52.5	87.7	59.8	24.6	1.176	36.8	15.7	50.9
Sept. 15	56.9	86.2	54.5	25.2	1.176	39.9	17.0	46.3
Oct. 15	38.7	79.3	58.8	18.2	1.154	29.9	8.8	49.4
Nov. 15	32.6	68.8	54.4	18.2	1.180	22.7	9.9	46.1
Dec. 15	35.4	64.3	50.4	21.4	1.215	22.9	12.5	41.4
1959								
Jan. 15	34.8	59.6	47.1	22.4	1.237	21.5	13.3	38.1
Feb. 15	27.4	53.7	45.5	19.1	1.236	16.9	10.5	36.8
Mar. 15	33.6	50.8	42.3	25.1	1.297	18.2	15.4	32.6
Apr. 15	31.8	48.8	42.3	25.3	1.314	16.6	15.2	32.2
May 15	28.2	31.5	27.8	24.5	1.410	11.8	16.4	19.7
Jun. 15	28.8	36.1	30.1	22.8	1.351	13.8	15.0	22.3

* Computed as described in text, from data in U.S. Dept. Agr., *Commodity Futures Statistics*, Stat. Bulls. Nos. 221, 239, 256.^a Equal amounts long and short.

times when the hedging load is light relative to the amount of speculation in a market (the speculative index high), the price is determined mainly by speculative opinion, with little reliance on long hedging to carry part of the short hedging (or little reliance on short hedging to carry part of the long hedging). It is for this reason that the amount of balancing hedging, long and short, is a varying proportion of the total long (or of the total short) hedging. In the data shown in the chart, the amount of balancing hedging fell as low as 41 per cent of the smaller of the two hedging totals (May 31, 1959).

Two mathematical relationships between curves in Chart 6 deserve comment: (1) The excess of long speculation, S_L' , over unbalanced short hedging, H_S^U , is an excess that should be measured by the speculative index, according to our definition of that index;²⁴ and so it is— $S_L'/H_S^U = T$. (2) Because total long contracts in a futures market must equal total short contracts, the excess of total short speculation, S_S' , over unbalanced long hedging, H_L^U , must equal the excess of long speculation over unbalanced short hedging.

The close correspondence between changes in the amount of long speculation and changes in the amount of unbalanced short hedging needing to be carried by long speculation is so obvious as to require no verbal emphasis. The amount of short speculation obviously varied in about equally close correspondence with variations in the amount of unbalanced long hedging. In the latter connection, it should be noted that the amount of long hedging, which depends primarily on the opinions of export buyers and of bakers regarding whether the price of wheat (and hence of flour) is likely to rise or fall, was more erratically variable than was the amount of short hedging (Chart 7).

Less conspicuous than the close correspondence between the two curves in each pair in Chart 6, but at least equally important, is the evidence that the chart gives of an approximately constant margin of difference between the two curves in each pair. This difference represents the amount of "unneeded" speculation, short and long, in the market. It is, of course, "unneeded" only in a physical, or arithmetical, sense. Economically, it is needed because no one can judge *accurately* what price is warranted by known supply and demand conditions at any given time, and price opinions among speculators therefore differ. This margin gives protection against the price, at times of heavy hedging pressure, falling so low that *no* speculator thinks it likely to go lower.

The amount of protective margin of "unneeded" speculation that is *economically needed* in a market depends primarily on the amount of divergence of price judgment that exists among speculators. It tends obviously to be relatively narrow if most speculators are expert and well-informed, and to be relatively wide if there is a considerable group of inexperienced or ill-informed speculators in the market. And, what is not so well recognized, the amount of "unneeded" speculation that is present in a market depends on the extent to which speculators specialize in giving attention to particular sorts of market information.

A great amount of economic information concerning current supplies and probable future supplies, and concerning current and probable future consumption demand—the latter influenced by consumer incomes and by prices of other

²⁴ This statement and the one that follows must have the words "long" and "short" interchanged when long hedging exceeds short hedging (in accordance with the definition of the speculative index).

commodities, both in this country and abroad—needs to be considered if the price is to reflect well the available supply and demand information. No one man can get all that information promptly and appraise it wisely. If all speculators give their attention to the same information, they may all form nearly the same price opinions, with the result that there will be little divergent speculation. But in that case there will be times when the price will not conform well to the basic supply and demand conditions, because everybody has overlooked some important information. On the other hand, if different groups of speculators specialize in giving attention to different classes of information, their price opinions will tend to differ considerably, giving rise to a good deal of divergent speculation. And with such specialization by speculators, there is less likelihood than otherwise that important economic conditions will fail to be reflected properly in the price.

Evidently, then, a widening of the margin of “unneeded” speculation in a market, as in wheat during October-November of 1957, may reflect either of two conditions. It may reflect entry into the market of a considerable group of inexperienced or ill-informed speculators; or it may reflect the recognition by one group of expert speculators of significant economic conditions or prospects that are currently being ignored by other, equally expert and generally well-informed, speculators. One would like to know to what extent each of these two possible explanations properly accounts for widening or narrowing of the margin at particular times, but presumably the statistics of hedging and of speculation cannot reveal that by themselves. We cannot undertake to fully explore such questions here.

I remarked earlier that there have been three obstacles to acceptance of the evidence that speculation enters a futures market in response to the needs for carrying hedges placed in the market, and enters in an amount fairly appropriate to the needs for carrying the hedging. The common impression that speculation in futures proceeds with little or no regard to hedging has been shown above to rest on a practice of identifying speculation with the readily visible evidences of it, namely the transactions by which it is initiated and terminated, whereas it is properly to be measured, in futures markets, by the volume of open contracts *held* speculatively. The obstacle of unsatisfactory character of the available data on hedging and speculative open contracts, in its original form, has been dealt with above by applying new and improved estimation procedures. There remain for consideration now the questions: What incentives do speculators have for adjusting the amount of speculation to the needs for carrying hedges? And how are speculators able to recognize hedging needs?

The incentive that speculators have for carrying hedges is simply the opportunity to profit by doing so. Speculators, as a group, can make profits only by “buying” from short hedgers at prices lower than those at which they can “sell” later, or by “selling” to long hedgers at prices higher than those at which they can “buy” later. An individual speculator is as willing to make a profit by dealing with another speculator as by dealing with a hedger, but speculators as a group can profit only by rendering a service for which hedgers are willing to pay. Though hedgers forego whatever profits speculators, as a group, make, they do so for the sake of one or another of the advantages obtainable by hedging. The incentive for speculators to seek to carry hedges is, then, simply the profit motive.

There are, broadly, two ways in which speculators recognize the profit opportunities presented to them by the offering of hedging contracts in the market. One of these is by such criteria as are used by scalpers and other quick-turn speculators. They learn, perhaps most importantly, to judge with satisfactory reliability when a small price dip is the result of "selling" pressure that will soon end and be followed by price recovery, and when a small price advance is the result of "buying" that will be similarly short-lived. The dips and advances on which scalpers operate are those very small ones associated with oscillation of the price between what amount to "bid" and "asked" prices. Besides the commonly recognized bid and asked prices that are close together, but are subject to rapid shifts in level, there exist in any market analogous pairs of prices that are farther apart, but more stable. In an *inactive* market it is these more widely spaced limits that provide the quoted bid and asked prices. In an active market, individual hedging orders of moderate size move the price only within the range of the commonly quoted and closely spaced bid and asked prices, while very large hedging orders, or waves of hedging, move the price through wider limits. Scalpers, who normally follow each "purchase" with a "sale" a few minutes later, tend to absorb, initially, the individual hedging orders of moderate size; other traders, willing to take larger market positions, and to hold them for a day, or a week, absorb the larger hedging orders and the waves of hedging, long or short. We noted above, in comment on Chart 7, evidence of the erratic waves of long hedging in wheat that have to be absorbed by that market.

Short hedging tends to enter the market for any annual crop in large quantity once a year, and much of it must be carried for many months. The various sorts of quick-turn traders help to carry this hedging for a time after it enters the market because, while the volume of short hedging is building up, they tend to operate always on the long side. Though it is commonly said that scalpers and other quick-turn traders always stand equally ready to either "buy" or "sell," this is not strictly true. Though they seek their profits on more or less quick turnover of contracts, they always seek to judge the longer-run price prospects, and normally take positions only on one side of the market, either long or short according to their judgment of those longer-run prospects. They do this partly as a means of selecting the larger profit opportunities, but more particularly as a means of limiting risks of loss.

But in the main, short hedges must be carried by speculators who are willing to hold positions for longer periods than the quick-turn traders like to carry their holdings. The incentive for them to carry short hedges must be that they think the price low enough to warrant taking a long position and holding it for a considerable period—not necessarily for the six or eight months or more that much of the short hedging will have to be carried, but at least for a substantial fraction of that time. Do speculators have such good price judgment that many of them are in fact led to "buy," and to hold contracts over fairly long periods, by recognition that the price is only moderately depressed by heavy short hedging? Economists, at least, have found it difficult to credit speculators with such good price judgment as seems necessary in order that speculation should respond sensitively to the hedging needs of a market.

My first clue to the answer to this troubling question was given me by professional speculators. With few exceptions, they have told me that they do not

try to judge what the price "ought" to be. They also often say that they disregard the market news, to which economists properly believe that speculators should be alert if they are to serve their economic function well. In order to understand what speculators are trying to say when they make these statements, it is necessary to recognize that neither statement is true in the same sense that most hearers tend to understand it.

Consider the latter of the two statements first, since it is the more readily interpreted. It is a statement that is made characteristically by quick-turn speculators whom one would expect to be especially alert to new market information. Watch their behavior at close range and you observe that they are indeed eagerly alert to new market information. What they mean when they say that they disregard the market news, is that what passes generally as market "news" is to them like last week's newspaper. And even so, they do not disregard it. It tends to be an explanation of the past rather than an indicator of the future, and most speculators follow it closely as an aid to interpreting what has happened lately in the market.

To understand how speculators are able to act as though they could form highly reliable judgments of what the price "ought" to be, it is particularly necessary to understand what they mean when they say they do not try to form such judgments. My best help on this point came from a speculator from whom the statement was superficially a believable one, because he was a "day trader" specializing in scalping and other quick-turn speculation within the day. He kept careful notes for me for a week, recording the thoughts uppermost in his mind at the beginning of each day's business, and every transaction that he made, and tried to explain the reason for each transaction.²⁵

The notes showed that he was giving close attention to a great amount of information pertinent to appraisal of what the price "ought" to be. And quite obviously he was doing so for profit, not out of mere curiosity or general interest.

Why, then, did this man tell me that he did not try to judge what the price "ought" to be; and why have others, of whom it was at least equally untrue, said the same thing? They are all very keenly aware of the unreliability of any individual's judgment of what the price "ought" to be.²⁶ What they meant was that they never rely heavily on their personal judgment on that score. They all have great respect for the "judgment of the market" as an expression of the

²⁵ Keeping such notes was itself a remarkable performance, because he was doing a bewilderingly complicated business all the while. My debt of gratitude to him must be obvious.

²⁶ There is much reason to believe that the principal explanation of the tendency for unskilled speculators to lose money rapidly is their naïve faith in their own judgments of what the price ought to be. They tend to pit their opinions directly against the almost certainly better "judgment of the market." If they were merely gambling, as a speculator might by merely tossing a coin to determine, initially, whether to "buy" or to "sell," and next day, whether to hold his previously taken position or close it out, they would tend to break even, apart from commission charges. Actually, they do much worse than that; which must mean that they are using judgment, but bad judgment. The outstanding factual analysis of speculator experience (9) attributes the losses of unskilled speculators largely to a tendency to "cut profits and let losses run"; but it can be demonstrated that the very real tendency that is commonly expressed in those words cannot produce an over-all tendency toward loss except when combined with use of bad market judgment otherwise. To test this assertion, the reader may try to devise a trading system based on coin-tossing that would tend to produce losses. One such system would use the rule: "buy" or "sell" according to the toss of a coin, then close out the trade at the first opportunity to take either a one-cent profit or a ten-cent loss, and repeat indefinitely. The mathematical expectation for such a system is that the "trader" will break even. If that were not so, a reversal of the rule would provide an easy route to wealth.

pooled opinions of many people—a sort of average of many opinions, in which individual errors of judgment tend to cancel out. They know also, consciously or unconsciously, that the market can be more or less mistaken, and that they must make their profit by taking advantage of the market's "mistakes." Their problem is to find means of striking a delicate balance between relying on their own fallible judgments, but not relying on them too much, and relying on the "market judgment," yet finding opportunities to make profits from disagreeing with the market judgment.

Different speculators find more or less different ways of striking this balance. A typical sort of solution is that found by my friend the "day trader." He formed his opinions on which way the price ought to move;²⁷ but he gave expression to those opinions indirectly and cautiously, using them as a guide to actions in which other considerations entered also. For example, if he expected a price rise for "fundamental" reasons, his quick-turn trading would tend to be always on the long side ("selling" only to close out long positions taken previously). In such ways skilled speculators make their opinions effective as part of the pool of many opinions that are reflected in the market price, and at the same time use the pooled market opinion as a guide in forming what an economist, if not they themselves, would call their opinions of what the price "ought" to be.

SUMMARY

The main conclusion that flows from the foregoing analysis and evidence is only a more precise and stronger statement of one reached by a few students of futures markets long ago, just a few years after the commencement of regular reporting of open contracts on futures markets. The main statistical evidence provided as a basis for the present version of the conclusion appears graphically in Charts 3 and 6 above (pp. 198 and 206). Chart 3 shows that the amount of long speculation, measured in dollar value of open speculative contracts, has differed greatly between commodities, some commodities having ten, twenty, or as much as several hundred times as much speculation as others; and that these differences in amounts of speculation depend primarily on the amounts of hedging in the markets. And Chart 6 illustrates the very close correspondence between changes from month to month, and within months, in amounts of speculation and of hedging. The conclusion that follows is obvious: Futures markets are primarily *hedging* markets. The amount of speculation in any futures market depends primarily on the amount of hedging that enters the market, and no such market can exist without a sufficient amount of hedging to support it.

These characteristics of futures markets could not be recognized until after statistics on open contracts were collected, because, in the absence of such statistics, people could observe only the transactions by which individual speculators initiated or terminated a period of speculative *holding* of futures contracts. People thus fell into the habit of identifying speculation with the transactions rather than with the *speculative holding* that is its essence, and in consequence were misled.

²⁷ One morning for example, his opening notes included the comment: "I was even and hadn't a clue, so decided to take it very easy today."

One obstacle to recognition of the dependence of speculation on hedging has been a belief that speculators have no great incentive to respond to the hedging needs of a market, and no reliable guide for adjusting their speculation to the hedging needs of the market. The final section above explains briefly why speculators try to respond to hedging needs, and how they are enabled to do so both sensitively and reliably.

The basic statistics on hedging and speculation, though published regularly now for a long list of futures markets, are incomplete, and especially so for speculation. In the past it has been usual to deal with this situation very crudely by taking the amount of hedging to be measured by the incomplete record of "reported" hedging, and taking the amount of speculation to be measured by "reported" speculation plus all nonclassified futures contracts. This procedure obviously gave a distorted comparison, but it had to be used until a better one was discovered. Even that crude procedure had sufficed to reveal the existence of a fairly close correspondence between amounts of short hedging and of long speculation in futures markets, but a better procedure was needed before the relation between speculation and hedging could be seen very clearly.

So long as only very crude comparisons could be made between amounts of speculation and of hedging, it was possible to learn only that amounts of long speculation corresponded roughly with amounts of short hedging. By using improved statistical estimates of total amounts of hedging and of speculation, we have gained a more accurate knowledge of the relation between long speculation and short hedging in futures markets and have discovered, additionally, that the amount of short speculation in a market is strongly influenced by the amount of long hedging. This discovery has been aided by solution of the problem of measuring the extent to which long and short hedging directly balance each other. Students of the statistics of futures markets recognized early that long hedging served in part to offset short hedging, but that the offset was only partial. Derivation, through statistical and mathematical analysis, of a *speculative index*, based on the available statistics of hedging and speculation, has led to a formula by which to calculate the amounts of long and of short hedging that balance each other. The extent of direct balancing varies with the speculative index, for a reason that has been explained above (p. 200).

TECHNICAL APPENDIX

1. *Procedure.* In a full statement of the argument that follows, the terms to be used and the formulas derived would differ systematically according to whether $H_s \geq H_L$, as is usually the case in any futures market, or the infrequent opposite condition exists. The argument would be complicated, and nothing would be gained, if the two possible conditions were carried forward simultaneously. Therefore, I proceed for the most part on the assumption that $H_s \geq H_L$, and at the end I note what changes are required to fit the condition, $H_L > H_s$. Under the final heading two parallel sets of formulas are given for computational use. It is mainly in computational work that there is need to take account of whether $H_s \geq H_L$ or not. At the point $H_s = H_L$, the two sets of formulas give identical results.

2. *Estimation of totals of speculation and hedging.* The problem of estimating

total amounts of speculation and of hedging, long and short, is one of making an allocation of nonclassified contracts, N , among the categories of hedging, H , speculation, S , and matching contracts, M (the latter being long and short contracts that offset each other in individual accounts). To these letters we add subscripts, L and s , to designate whether the contracts are long or short. Total short hedging, for example, may then be described in relation to the officially reported statistics as consisting of $H_s = H_s^* + H_s^\circ$, where the asterisk designates open hedging contracts explicitly classified ("reported") in the published statistics, and the superscript zero designates hedging contracts of "non-reporting" (small-scale) holders of short contracts. *Estimates* of total short hedging are designated H_s' . Statistics and estimates of total contracts in other categories than H are similarly distinguished by superscripts, in addition to the subscripts distinguishing long from short contracts.

Several necessary equalities have to be borne in mind, represented by the following:

$$(1) \quad H_s = H_s^* + H_s^\circ$$

$$(2a) \quad H_s + S_s = H_L + S_L$$

$$(2b) \quad M_s = M_L.$$

Equation (1) holds with replacement of S or M for H , and with either subscripts s or L throughout. Equations (2) hold either for true values of the quantities, as written above, or for estimates of each, such as H_s' , etc. (see Chart 1).

I make only two assumptions that affect estimates of the ratios among the four quantities, H_s' , H_L' , S_s' and S_L' , and these lead directly to the estimation equations for two ratios,

$$(3a) \quad r_h' = \frac{H_L'}{H_s'} = \frac{H_L^*}{H_s^*}, \quad (H_s^* \geq H_L^*)$$

$$(3b) \quad r_s' = \frac{S_L'}{H_s'} = \frac{S_L^* + N_L}{H_s^* + N_s} = \frac{S_L + H_L^\circ + M_L^\circ}{H_s + S_s^\circ + M_s^\circ} \quad (H_s^* \geq H_L^*).$$

From these it follows obviously that $H_L'/S_L' = r_h'/r_s'$, and any other desired ratio between estimates may be obtained with the further aid of the equality, $H_s' + S_s' = H_L' + S_L'$. For example, $S_s'/H_L' = 1 + (r_s - 1)/r_h$. If $H_L^* > H_s^*$, better reliability is obtained by basing estimates on the ratio

$$(3c) \quad r_s' = \frac{S_s'}{H_L'} = \frac{S_s^* + N_s}{H^* + N_L} \quad (H_L^* > H_s^*).$$

The same symbol, r_s' , is used in both (3b) and (3c) above because the parenthetical remark at the right constitutes a part of each expression. We shall deal throughout with expressions in which subscripts of the variables interchange when $H_L > H_s$. The ratio r_h' might be defined without regard to the relative magnitudes of H_s^* and H_L^* , but to do so would require treating expression (3a) differently than other expressions, and thus tend to make trouble.

One further assumption is needed in order to assign a value to any one or more of the desired *quantities*, such as H_s' , and for that purpose I assume that $H_s^\circ = H_L^\circ + M_L^\circ$, (if $H_s^* \geq H_L^*$), which leads to the estimation equation,

$$(4) \quad H_s' + S_L' = H_s^* + S_L^* + N_L \quad (H_s^* \geq H_L^*).$$

Consequently, this assumption, along with the two previous ones, allows estimation of the six quantities, H_s , H_L , S_s , S_L , M_s and M_L , the latter two of which are of course equal.

Though each of the assumptions made above is subject to error, their usefulness in combination is to be judged in relation to the assumptions implicit in the previously general practice of taking hedging to be satisfactorily measured by H_s^* and H_L^* , and speculation by $S_L^* + N_L$ and $S_s^* + N_s$. That implicitly assumed that $H_s^\circ = H_L^\circ = M_s^\circ = M_L^\circ = 0$, which involves three distinct assumptions that together must ordinarily, if not always, be farther from the truth than the three assumptions that we make here.

3. *The speculative index.* Derivation of the speculative index starts from the obvious proposition that, in the absence of long hedging, the ratio, $r_s = S_L/H_s$ would make a good index of the relation of total speculation to the amount of speculation "needed" to carry the hedging in the market. In the absence of long hedging, $S_L = H_s + S_s$, hence for that condition the speculative index, T , may be written, $T = 1 + S_s/H_s$. The question then arises: How should the speculative index be calculated in the presence of long hedging?

This problem may be treated empirically by ascertaining how r_s varies with r_h , and for that purpose Chart 2 was constructed. If the eleven observations shown in the chart could all be regarded as samples from a common population, an appropriate procedure would be to compute a least-squares regression to express the relation between the two ratios. But I knew that the observations came from markets having differing speculative characteristics, making it appropriate to derive more than one line of relationship, each intended to represent the relation between the two ratios in a group of markets with common speculative characteristics. When that was undertaken, it became apparent that each line drawn tended to have an equation that could be written either in the form, $S_L = (1 + \alpha)H_s - (1 - \alpha)H_L$, or as $S_s = \alpha(H_s + H_L)$. Thus the parameter α reflected the speculative characteristics common to each group of markets; and because α may be determined from a single observation, that parameter could be used, with these data, to measure the average speculative characteristic of a single market. Used thus, its equation would be, $\alpha = S_s/(H_s + H_L)$; and under the condition for which I knew how to derive a useful speculative index, namely with $H_L = 0$, I had $\alpha = S_s/H_s = T - 1$. Hence it was evident that an expression for the speculative index could be written,

$$(5) \quad T = 1 + \frac{S_s}{H_s + H_L} = \frac{S_L + 2H_L}{H_s + H_L} \quad (H_s \geq H_L).$$

The second expression for T in (5) above comes from converting the first one to an improper fraction and recognizing that $H_s + S_s = S_L + H_L$. Obviously, $T \geq 1$.

4. *Partial balancing of H_s and H_L , and of S_s and S_L .* It is useful to be able to compute the extent to which long hedging balances short hedging, thereby reducing the amount of net long speculation needed to carry the short hedging. Such balancing, which is accompanied also by partial balancing of long speculation by short speculation, has been illustrated in Chart 4 above.

To deal with the balancing concept, I use the notation of the following equations:

$$\begin{aligned} H_s &= H^B + H_s^U, & H_L &= H^B + H_L^U \\ S_s &= S^B + S_s^U, & S_L &= S^B + S_L^B \end{aligned} \quad (H_s \geq H_L)$$

where the superscripts indicate, respectively, the amounts of short and long hedging (speculation) that balance each other (B) and the remaining, unbalanced (U), portions of both short and long hedging (speculation). Then the *relative* amounts of balancing may be expressed in the form,

$$\begin{aligned} H^B &= p_h H_s \\ S^B &= p_s S_L \end{aligned} \quad (H_s \geq H_L),$$

where p_h and p_s represent *proportions* of short hedging and of long speculation, respectively, that are balanced by equal amounts of long hedging and short speculation, respectively.

It follows then (see Chart 4) that,

$$S_L - S^B = H_s - H^B \quad (H_s \geq H_L),$$

and we may readily derive,

$$(6) \quad 1 - p_s = (1 - p_h) \frac{H_s}{S_L} \quad (H_s \geq H_L).$$

Note that the relation between p_s and p_h thus arrived at is general, within the limits stated parenthetically, and is reached without the aid of any assumption except that balancing *may* occur. We do not require that balancing occur, inasmuch as both p_s and p_h are left free to take zero values. The ranges of possible values of the two p 's are given by,

$$0 \leq p_s \leq S_s/S_L; 0 \leq p_h \leq H_L/H_s \quad (H_s \geq H_L).$$

Suppose, now, that we are ignorant of the empirical evidence concerning the general expression for T ; let us see how much we can learn about the speculative index, T , from expression (6) and the basic definition,

$$T = S_L/H_s \quad (H_L = 0).$$

In the special case of this definition, there is no long hedging to balance short hedging, hence $p_h = 0$, and expression (6) becomes, $1 - p_s = H_s/S_L = 1/T$. We see, therefore, that T must satisfy the general condition,

$$(7) \quad (1 - p_s) = \frac{1}{T}.$$

It will become evident later, if it is not at this point, that expression (7) is entirely general, not restricted to the condition $H_s \geq H_L$.

Substituting the definition of p_s in expression (7) leads readily to

$$(8) \quad S^B = \left(1 - \frac{1}{T}\right) S_L \quad (H_s \geq H_L),$$

where the parenthetical qualification is required again because of its association with the definition of p_s .

Substituting expression (7) in expression (6), taking reciprocals of both sides, and writing an equivalent for $(1 - p_h) H_s$, gives

$$(9) \quad T = \frac{S_L}{H_s - H^B} = \frac{S_L}{H_s^U} \quad (H_s \geq H_L).$$

If we now substitute in (9) the empirically derived expression, $T = (S_L + 2H_L)/(H_s + H_L)$, and rearrange terms, we have

$$H_s + H_L = (H_s - H^B) \left(1 + \frac{2H_L}{S_L}\right) = H_s - H^B + 2H_L \frac{H_s - H^B}{S_L} \quad (H_s \geq H_L).$$

Then substituting from expression (9), rearranging and simplifying,

$$(10) \quad H^B = \left(\frac{2}{T} - 1\right) H_L \quad (H_s \geq H_L).$$

Expressions (8) and (10) show that T , conceived as a speculative index to express the relation of amount of speculation to amount of hedging in relative terms, with unity representing the minimum amount of speculation capable of carrying the hedging, measures also the extent of direct balancing that occurs between long and short speculation and between long and short hedging. This appears more explicitly if the two expressions are written as

$$p_s = 1 - 1/T$$

$$p_h = 2/T - 1.$$

Here, as in expression (7), the relations are entirely general, not restricted to the condition, $H_s \geq H_L$.

To adapt the argument of this appendix to the condition $H_L > H_s$, all that is needed is to interchange subscripts, writing L for s and s for L in all expressions where either appears, and to make corresponding changes in all verbal references to the variables. The lower-case subscripts of r and p remain unchanged.

5. *List of useful formulas.* As an aid to computations, the more widely useful expressions are given below in the two forms in which they may need to be used. My experience suggests that in computing estimates from the published data it is wise to carry at least four significant figures, wherever possible, even though it be unlikely that more than two digits will be meaningful in the final estimates. The symbol (\approx) is used below to mean "estimated as"; hence the expressions, $r_h \approx H_s^*/H_s^*$ and $r_h' = H_L^*/H_s^*$ are equivalent. The final four pairs of ex-

pressions below, written explicitly in terms of known values of the variables, apply also to estimates—that is, with (') added throughout.

When $H_s \geq H_L$	When $H_L \geq H_s$
$r_h = H_L/H_s \approx H_L^*/H_s^*$	$r_h = H_s/H_L \approx H_s^*/H_L^*$
$r_s = S_L/H_s \approx \frac{(S_L^* + N_L)}{(H_s^* + N_s)}$	$r_s = S_s/H_L \approx \frac{(S_s^* + N_s)}{(H_L^* + N_L)}$
$H_s' = (H_s^* + S_L^* + N_L)/(1 + r_s')$	$H_L' = (H_L^* + S_s^* + N_s)/(1 + r_s')$
$S_L' = r_s' H_s'$	$S_s = r_s' H_L'$
$H_L' = r_h' H_s'$	$H_s' = r_h' H_L'$
$S_s' = S_L' + H_L' - H_s'$	$S_L' = S_s' + H_s' - H_L'$
$M_L' = (S_L^* + H_L^* + M_L^* + N_L) - (S_L' + H_L') = M_s'$	$M_s' = (S_s^* + H_s^* + M_s^* + N_s) - (S_s' + H_s') = M_L'$
$T = 1 + \frac{S_s}{H_s + H_L} = \frac{2r_h + r_s}{1 + r_h}$	$T = 1 + \frac{S_L}{H_L + S_s} = \frac{2r_h + r_s}{1 + r_h}$
$H^B = (2/T - 1)H_L$	$H^B = (2/T - 1)H_s$
$H_s^U = H_s - H^B = S_L/T$	$H_L^U = H_L - H^B = S_s/T$
$H_L^U = H_L - H^B = 2(1 - 1/T)H_L$	$H_s^U = H_s - H^B = 2(1 - 1/T)H_s$

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