THE ADEQUACY OF SPECULATION ON THE WHEAT, CORN, AND SOYBEAN FUTURES MARKETS

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The commodity futures industry can be aptly described by one word—growth. Prior to 1965, futures trading was confined to storable agricultural commodities. Major markets were those for corn, wheat, soybeans and cotton. Since 1965, futures trading has been successfully adapted to commodities as diverse as live cattle, Government National Mortgage Association Certificates (GNMA's), and 90-day Treasury Bills. Silver has reemerged as a futures market and with it have come markets for gold and platinum. In addition, the older markets have grown remarkably, with current levels of open interest approaching ten times those of the mid-sixties.

It seems safe to surmise, therefore, that speculation on commodity futures markets has grown over the past fifteen years. However, the rapid

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development of new markets combined with the growth in established markets leaves open the question of the adequacy of current levels of speculation on individual markets. The question is particularly significant since some markets, generally the older, established markets, are subject to speculative position limits. Individual speculators on these markets may hold positions no longer than the Commodity Futures Trading Commission's (CFTC) designated maxima.

Using the corn, wheat, and soybean markets as examples, this paper examines changes in levels of speculation over the past fifteen years. As will be seen, absolute or even relative changes in speculation are not meaningful. Rather, speculation must be measured in terms of the demands that commercial firm's positions place upon the market. In these terms, data presented here will show that there have been significant declines in speculation on the corn, wheat, and soybean futures markets. Finally, the question is asked whether these declines have significantly affected market performance.

Recent Trends in Speculation on Three Markets—

Participants on futures markets are categorized as hedgers and speculators. Hedgers are commercial firms whose business involves transactions in the actual commodity. They include, in grain markets, farmers, elevator operators, merchants, exporters, processors, and the like. The futures positions of these traders are integral to their purchases and sales of the actual commodity. Speculators, on the other hand, buy and sell futures contracts solely to profit from futures price changes.

In the futures literature, three kinds of speculation have been distinguished—position trading, spreading, and scalping. Position trading is the most widely recognized form of speculation. Futures contracts are bought (sold) in expectation of prices rising (falling). Position traders use both technical analyses of price patterns and fundamental market information to determine their trading. The second form of speculation, spreading, is the simultaneous buying and selling of two futures contracts of differing maturities (e.g., buy one July wheat contract and sell one May wheat contract). Spreaders intend to profit from expected changes in relative contract prices, not in price levels per se. Finally, scalping is the term applied to the activities of the market makers who provide liquidity to the market. These individuals trade large numbers of contracts during a trading session as they attempt to profitably accommodate the flow of orders into the market. Holbrook Working (1967) has described these traders as always standing ready to buy or sell at a price only slightly below or above the last price quotation. And, while the daily trading of scalpers is sizable, they tend to have zero or very small positions overnight.

The question to be addressed here, the adequacy of speculation, focuses primarily upon the levels of activity of position traders. Spreaders have no net position in the market and scalpers tend not to have overnight positions. Thus, it is the position trader who accommodates the often unbalanced demands of hedgers to buy and sell futures contracts. Spreaders and scalpers are important to the functioning of the market—scalpers providing continuous liquidity and spreaders matching orders to buy and sell in different maturities. But, in terms of overall market balance, it is the position traders who are the important speculators.

Trends in hedging and speculation may be aproximated from data in the Commitments of Traders reports published monthly by the CFTC. These data first classify the open interest into large and small trader categories. In the grain markets, traders with positions smaller than 500,000 bushels are considered small, or nonreporting, traders.[1] Traders who individually assume large positions must report these positions continuously to the CFTC. Further, these reporting traders must identify whether their positions are speculative or hedging. If a position is identified as a hedging position, the individual must also report his positions in the cash market which justify the categorization hedging. Thus, in the monthly summary reports, the positions of reporting traders are further classified as speculative (position trading or spreading) or hedging.

The representativeness of these data depends largely on the size of the unclassified, small trader category. Moreover, changes over time in the size of the residual category complicate interpretation of the changes apparent in the reporting categories. The solution adopted here was to allocate the positions in the nonreporting category to hedging, spreading, and position trading according to procedures suggested by the work of Larson (1961) and Rutledge (1979).[2] In effect, the distribution of positions among the reporting categories is used to apportion the nonreporting postions (Peck, 1981). Once the nonreporting positions have been classified, these are added to the reporting positions and total hedging, spreading, and position trading are derived.[3]

Charts 1, 2, and 3 depict trends in these total positions data for the corn, wheat, and soybean futures markets over the period 1964–1977. The observations are crop-year averages of the monthly data (1964 is the 1964/65 crop year).[4] Spreading positions are identified as matching positions on these charts because only spreads on the Chicago markets are included.[5] Finally, the data have been expressed as percentages of the total open interest to provide a clearer picture of relative changes in market composition.

Two fundamental changes in these markets' composition are evident in these graphs. First, both long and short hedging have increased more than the increases in the open interest over this period. Second, the pro-

Chart 1. Trends in Hedging and Speculation in the Corn Futures Market, 1964–1977

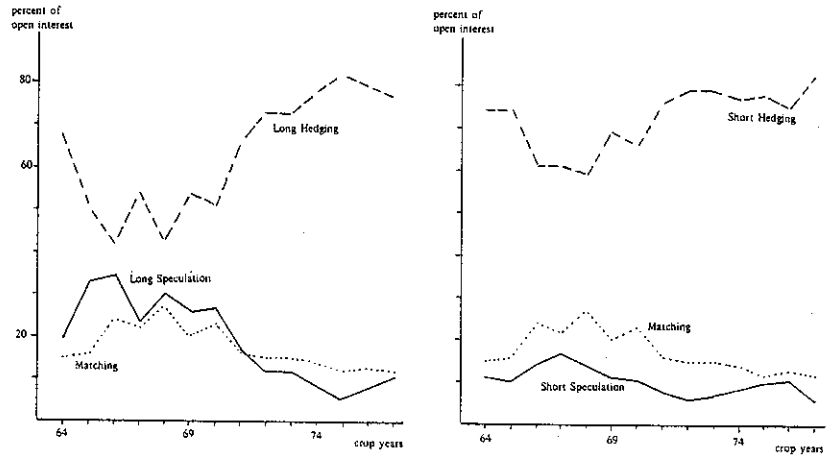
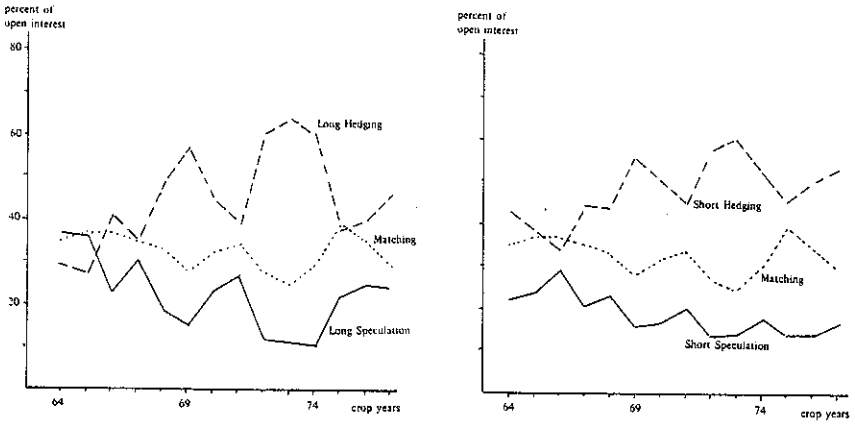
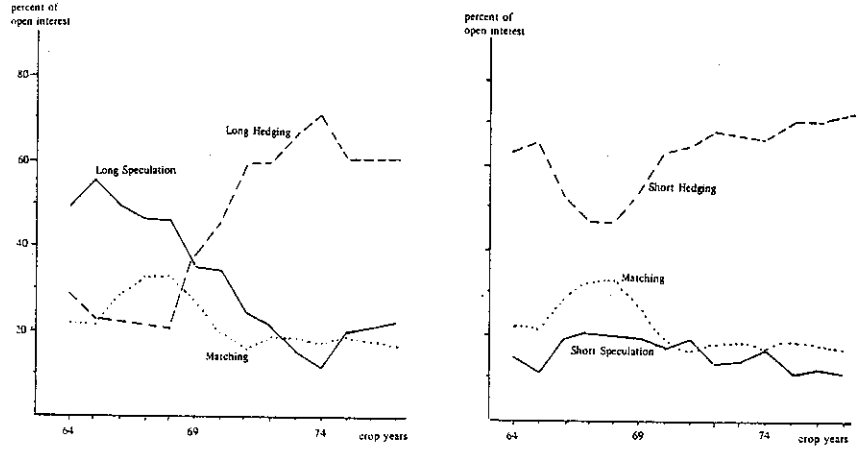


Chart 2. Trends in Hedging and Speculation in the Soybean Futures Market, 1964–1977



portionate increase in long hedging has been significantly greater than that in short hedging. These changes imply simultaneous decreases in speculation as a percentage of the open interest. With matching positions remaining fairly constant, both long and short speculation have declined and long speculation has declined more than short.

Chart 3. Trends in Hedging and Speculation in Chicago Wheat Futures Market, 1964–1977



The growth of an increasing balance in hedgers' use of these future markets reflects directly changes in the underlying cash markets. Exports have become much larger percentages of the total use of all three of these crops. Increased exports have lead to increased long hedging since exporters generally are purchasers of futures contracts as temporary substitutes for the purchase of the cash grain to be exported. In addition, increased relative exports means that more of the commodity is in commercial channels longer. Much of this movement will be accompanied by short hedging.

Growth in exports has been accompanied by decreasing direct government participation in these commodity markets. The tremendous government-owned surpluses of the sixties were depleted in the early seventies. Though some stocks have been accumulated anew, the extent of this form of government control is less and the programs are generally much more flexible. Simultaneously, direct, nonprogram-oriented government interventions in markets have increased, as exemplified by the varying rationales with which export embargoes have been justified. These changes in commodity politics plus the increased dependence upon exports have lead to dramatic increases in commodity price variability. Thus, the incentive to hedge has increased markedly over this period, resulting in the growth in hedging seen in these charts.

The relative increase in hedging, explicable in terms of fundamental changes in markets, implies a relative decline in speculation, also clearly displayed in the charts. However, the relative decline in speculation may

not reflect a similar decline in speculative adequacy. With increased balance in long and short hedging, much hedging could be expected to be offsetting and, hence, less speculation may be required. To consider the question of speculative adequacy, speculation must be considered relative to levels of hedging.

The Speculative Index

Holbrook Working's (1960) speculative index was developed to measure speculation relative to hedging. The speculative index is understood most easily by considering the potential relationships between long speculation and long hedging, both measured relative to short hedging, in markets where short hedging exceeds long hedging.[6] Define the speculative ratio (SR) as long speculation (SL) divided by short hedging (HS) and the hedging ratio (HR) as long hedging (HL) divided by short hedging.

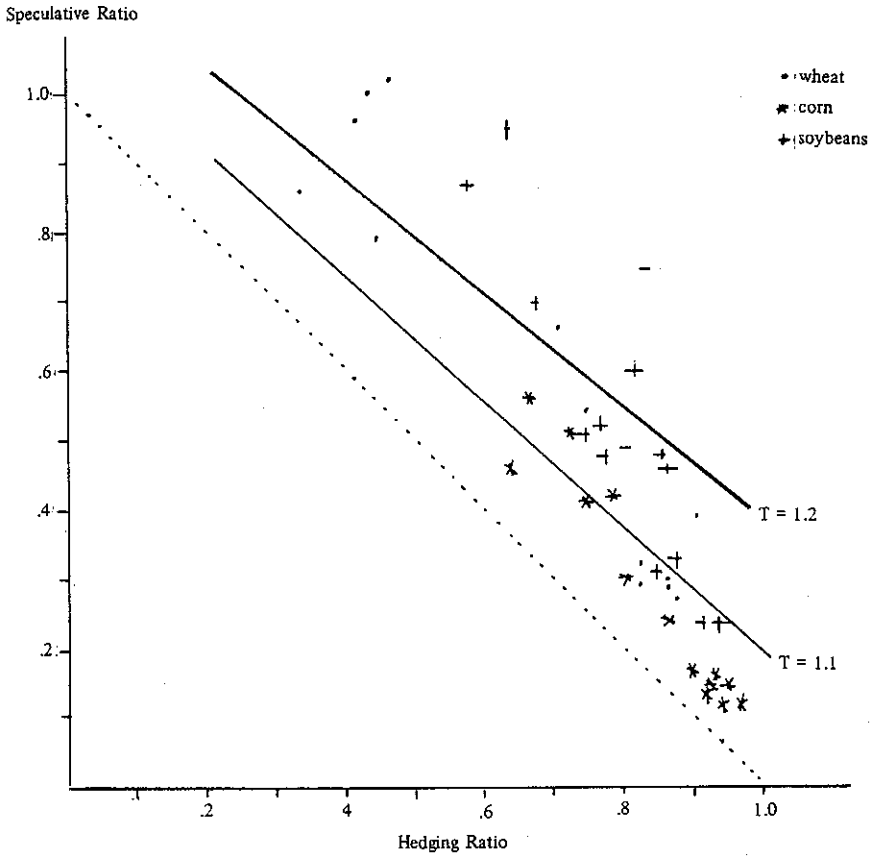
In Chart 4, the speculative ratio is plotted on the vertical axis and the hedging ratio is on the horizontal axis. The dotted line represents the minimal relationship between the two indices. For example, if there is no long hedging, the hedging ratio is zero and the speculative ratio must equal one at a minimum. That is, there must be at least enough long speculation to match the short hedging. Each point on the dotted line represents a similar minima. The relationships shown on Chart 4 apear to neglect short speculation. However, the fundamental identity between the positions, the sum of long hedging and long speculation must equal the sum of short hedging and short speculation, insures that, in fact, short speculation has not been ignored. Each point also implies a unique value for short speculation, given the three included variables.

One obvious candidate for a speculative index in Chart 4 would be a measure based upon lines parallel to the dotted line. All points on any such line would have exactly the same amount of long speculation relative to the balance between long and short hedging. Such an index, however, assumes that all long and short hedging should be offsetting. The speculative index proposed by Working is an empirical reflection of the possibility that not all hedging will be offsetting. This index is represented by the solid lines in Chart 4 which show three different levels of the index. The lines are not as steep as the minimal (dotted) line, representing the likelihood that not all long hedging can be viewed as offsetting short hedging. All points on any one line are defined as equally "speculative" markets. These lines are defined by the equation:

$$\frac{SL}{HS} = (1 + \alpha) - (1 - \alpha)\left(\frac{HL}{HS}\right) \qquad (HS \geq HL)$$

where α is a parameter common to both the slope and the intercept term.

Chart 4. The Relationship Between Hedging and Speculative Ratios for Wheat, Corn and Soybeans, 1964–1977*



*Based on crop year averages of estimated total hedging and speculation from the CFTC "Commitments of Traders" reports. See text for the definitions of hedging and speculative ratios.

With the addition of the market clearing relation, HL + SL = HS + SS = TO − M, where TO is the total open interest and M is matching, the above relationship can be manipulated to give:

$$\alpha = \frac{SS}{HL + HS}. \qquad (HS \geq HL)$$

The speculative index (T) is then defined as:

$$T = 1 + \alpha = 1 + \frac{SS}{HL + HS}. \qquad (HS \geq HL)$$

More generally, define SR as the speculative ratio and HR as the hedging ratio, then lines of equal speculation are defined by:

$$SR = (1 + \alpha) - (1 - \alpha)\ HR$$

When short hedging exceeds long hedging ($HS \geq HL$) we have $HR = \frac{HL}{HS}$, $SR = \frac{SL}{HS}$ and $T = 1 + \frac{SS}{HL + HS}$. When long hedging is larger ($HL > HS$), we have $HR = \frac{HS}{HL}$, $SR = \frac{SS}{HL}$, and $T = 1 + \frac{SL}{HS + HL}$.

The data points shown in Chart 4 are the annual average hedging and speculative ratios for the wheat (.), corn (*) and soybean (+) markets for the period 1964–1977. Though the points are not identified by years, the more current years' observations tend to be on the right-hand side of the graph. The general drift from left to right of the observations reflects the increased hedging balance (hedging ratios closer to one) on all three markets. Comparison of the points with the Working index lines of 1.2 and 1.1 shows there has also been a marked decline in speculation, even when the increased hedging balance has been accounted for.

For example, in the soybean market, the speculative index's average value was 1.23 over the period 1964–71. From 1971–77, the index averaged on 1.13. In the earlier period, speculation averaged 23 percent more than was required to balance hedging, while in the later period it was only 13 percent in excess. In corn, T declined from 1.09 to 1.04 while in wheat the decline was from 1.22 to 1.09. While these declines are significant, the real question is whether the declines have measurably affected market performance.

Tests of the Adequacy of Speculation

If speculation on a market were inadequate, one would expect prices to have to move further from their equilibrium values to induce increased speculation. Thus, the daily trading range is the most likely place aberrant performance would first appear. Since the observations on market positions and hence the speculative index are monthly, the monthly average of the daily trading range will be used as the measure representing pricing performance in the following analysis. Market composition is known at the end of each month. Therefore, the speculative index calculated for the end of, for example, February, will be related to the average daily trading range in March.

Unfortunately for our purposes, the daily trading range is also influenced by the activities of market makers, the scalpers, and by new information. The first problem is handled by including a measure of

scalping, the average daily trading volume (divided by the month end open interest), in the analysis. The influence of new information on the trading range is more a problem since it is likely that the character and importance of that information has changed markedly in the period 1964–1977. The decreasing influence of government programs domestically and the increasing importance of export markets combine to alter dramatically the potential importance of information. Two variables, the monthly range of prices and the standard deviation of the daily trading range over the month are included to at least partially reflect these changes. Other alternatives are possible and some of these will be discussed below.

In sum, the average daily trading range is hypothesized to be related to the speculative index, the monthly trading range, the standard deviation of the daily trading range, and the volume of trading relative to the open interest. Estimates of these hypothesized relationships are shown in Table 1. The observations were monthly, covering the crop years

Table 1. Tests of the Price Effects of Changes in Speculation in the Wheat, Corn, and Soybean Futures Markets, 1964–1977*

Commodity	*Constant*	*Speculative index*	*Monthly trading range*	*Standard deviation of daily trading*	*Volume ÷ open interest*	R^2
Wheat						
I	1.27	−2.24	0.04	1.11	13.63	.8938
	(0.74)	(−1.62)	(4.26)	(7.34)	(6.13)	
II	1.01	−0.89	0.03	0.74	4.38	.8528
	(2.56)	(−2.84)	(3.63)	(5.69)	(8.75)	
Corn						
I	5.82	−5.83	0.01	1.24	8.35	.8942
	(3.68)	(−4.01)	(1.70)	(10.38)	(5.57)	
II	2.05	−1.86	0.01	1.12	3.4	.7931
	(3.08)	(−3.08)	(1.16)	(8.71)	(4.63)	
Soybeans						
I	8.53	−9.36	−0.02	1.59	25.37	.8365
	(2.33)	(−3.14)	(−2.59)	(14.67)	(7.21)	
II	1.25	−1.20	−0.00	1.09	4.12	.7518
	(2.57)	(−3.05)	(−0.30)	(9.28)	(8.50)	

*The dependent variable in all equations is the average daily trading range of the nearby future. In equations I, all price variables are in cents per bushel. In equations II, all price variables are in percentages of midrange monthly prices. Price data are from the Chicago Board of Trade, *Statistical Annual*. The Speculative Index, calculated as described in the text, is based on the Commodity Futures Trading Commission (formerly Commodity Exchange Authority), "Commitments of Traders," monthly data. Figures in parentheses are t-statistics.

1964–1977. In equations labeled I, all price variables were in levels, cents per bushel. In equations labeled II, the price variables were expressed as percentages of a monthly price.

Given the "first approximation" character of the model, the results are impressive. Virtually all of the independent variables are significant and have reasonable signs. Both variables reflecting the increased importance of news to the market, the monthly range and the standard deviation of the daily trading range, are significant and positive in most cases. Much of the evident change in the daily trading range can be attributed to these variables. Secondly, volume of trading explains much of the remaining variation in the trading range. The relationship is positive, consistent with Rutledge's (1978) analysis, which suggested that increases in the trading range tend to attract volume. His causality tests used daily data; hence, the positive coefficient here is not surprising.

The only coefficients which appear inconsistent in these results are those for the monthly trading range variable in the soybean equations. More than the other two markets, the soybean market had numerous months in which large trading ranges were accompanied by frequent limit price changes. The calculation of monthly average trading ranges used here included true limit days as zeros. Redefinition of the dependent variable to exclude these observations probably would make more analytic sense. The negative coefficients in these equations probably reflect the anomalous limit days rather than a consistent pattern. Further work is needed to explore this possibility more carefully.

The exciting aspect of these results is that the speculative index remains significant even when all these control variables are included. It is significant in both the price-level equations (I) and the percentage price equations (II). Its coefficient is uniformly negative. The declines in speculation are significantly associated with increases in the average daily trading range. Thus, the declines in speculation in these markets appear to be having marked influence on market performance.

Several alternative formulations of this basic model have been examined as well. The specific results are not presented because they differ little from those shown in Table 1. Primary concern centered on the speculative index since it is not the only conceivable measure. Returning to Chart 4, a clear alternative to the Working lines of equal speculation (T = 1.1 and 1.2) are lines parallel to the dotted line of absolute minimal speculation. With this concept, a different speculative index was calculated and used in a regression analysis as before. Yet a third alternative index could be constructed from simple net hedging relationships. Long (short) speculation must exceed net short (long) hedging by the amount of short (long) speculation. Thus, short (long) speculation is itself an index.

This relationship is true whether the data are percentages of open interest or in actual levels, so two indices are possible here.

All of these alternative speculative indices were tested in the basic hypothesized relationship. The results were so similar to those in Table 1 that they are not reported separately. The coefficient for the speculative index always had a negative sign and was significant except in some of the equations when actual levels of short (long) speculation was the index. The consistency of the results for the various measures of speculation strengthens the argument that speculation has become inadequate.

Conclusions

In spite of the tremendous overall growth in futures markets and in speculation on futures markets, speculation has declined significantly on the three largest agricultural futures markets. And this decline has been associated with increased price variability. The commodity exchanges have been aware of the potential difficulties that the rapid growth of new markets could create for the preexisting markets. As new markets have been introduced, various new forms of exchange membership have been created both to provide liquidity to the new markets (by restricting the trading of owners of these limited memberships to designated markets) and to develop new professional speculators. More recently, exchanges have permitted members who were not using their trading privileges to lease their memberships to other individuals. These steps are clearly directed toward preventing and/or alleviating speculative shortages.

Another possible solution requires regulatory revisions. Currently, speculator's maximum positions in these three markets are limited to 3 million bushels. The so-called speculative limits were created with the 1936 Commodity Exchange Act and limits in corn and wheat were originally established at 2 million bushels and are now 3 million bushels. Limits in the soybean market were first established at 1 million bushels in the 1950s and subsequently raised to 2 and then 3 million bushels. The CFTC, which now regulates all futures trading, has been considering whether to impose position limits on speculators in all futures markets. The evidence presented here does not address the question of whether position limits ought to exist. Rather, it suggests only that consideration ought to be given to raising those now in existence, and, particularly those which apply to the wheat, corn, and soybean markets.

Finally, the research here has focused attention on periods of declining speculation and its effects. Equally important from a regulatory viewpoint is the question of "excessive" speculation. Are there performance implications for markets which are characterized by much higher levels of

average speculation? One might, for example, hypothesize increasing instability in prices in situations of both low and high relative levels of speculation. Balanced, informed regulation can be expected only as both situations are identified and their effects determined.

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NOTES

1. Prior to July 1977, the reporting level in the grain markets was 200,000 bushels.
2. The alternative is to assume that all small traders' positions are speculative. Employing this assumption, speculative declines were even larger than those reported in this paper, primarily because the size of the nonreporting category has decreased significantly over time.
3. Reported long spreading does not always exactly equal reported short spreading, as spread positions taken between markets (e.g., Chicago and Kansas City Wheat or Chicago Board of Trade and Mid-America Exchange Corn) are included in these data. The discrepancy is largest in the wheat data. All unmatched reported spreading has been added to appropriate (long or short) reported speculation before the nonreporting data are apportioned.
4. All subsequent references to years or annual averages are to crop years or crop year averages, identified only by a year of harvest. The crop year in wheat begins in July, that in corn in October, and that in soybeans in September.
5. The difference between spreading and matching is most significant in wheat. Reported spreading in Chicago wheat includes spreading between the Chicago, Kansas City, Minneapolis and Mid-America markets. All unmatched spreading has been assigned as speculation long or short, as noted above.
6. The derivations are not limited to situations in which short hedging exceeds long hedging. When long hedging is larger, interchange the words long and short and all the arguments will follow.

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