Cash Settlement for Corn and Soybeans: A Preliminary Analysis

by

Robert Hauser, Nabil Chaherli, and Sarahelen Thompson

Suggested citation format:

Hauser, R., N. Chaherli, and S. Thompson. 1992. "Cash Settlement for Corn and Soybeans: A Preliminary Analysis." Proceedings of the NCR-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. Chicago, IL. [http://www.farmdoc.uiuc.edu/nccc134].

Cash Settlement for Corn and Soybeans: A Preliminary Analysis

Robert Hauser, Nabil Chaherli, and Sarahelen Thompson[1]

Considerable concern during the past two years has focused on the delivery system usec and oilseed futures contracts. Performance questions about expiring grain contracts were rekin(the Chicago Board of Trade (CBOT) ordered traders to liquidate their positions in the July 198 futures market such that by expiration no single trader would be holding more than 600 contr; purpose of this order was to force Ferruzzi Finanziari S.P.A. to liquidate its long positions, wl presumed by the CBOT to represent an attempt to corner the market.

The Ferruzzi incident as well as previous attempts of presumed price manipulation ii commodity markets prompted three major studies. These studies were independent and separate by the National Grain and Feed Association (Peck and Williams), the Chicago Board of Trade et al.) and the Commodity Futures Trading Commission (CFTC). Two general objectives of tl were (1) to determine whether price manipulation has occurred and, if so, (2) whether alternative locations and/or methods could be used to prevent future manipulation.

The Pirrong et al. study discusses the role of futures trading and the delivery pro(presents an interesting exposition on the theory of manipulation. The empirical focus is alternative delivery specifications for corn and soybeans, resulting in the implication that St. Lou be made an effective delivery location. The Peck and Williams study provides a thorough (analysis of corn, wheat, and soybean deliveries. In addition, hedging effectiveness measures to indicate the performance of the delivery system. Their general conclusion is that the additional delivery points is suspect, but that there may be a need to make short- and l adjustments involving discounts, premiums, and possibly "call on production" provisions. Th study focuses on the advantages of using the central Illinois region as a delivery area, with delivery points within the region separated by delivery differentials.

None of the above studies advocate cash settlement. The CFTC study suggests that further research (p. 68), whereas the other two studies explicitly reject the notion of cash settle grains (Peck and Williams, p. 125; Pirrong et al., p. 73). The following reasons for not consider settlement are offered (Peck and Williams, p. 125; Pirrong et al., pp. 65-73):

1. A cash settlement index for grains may be of poor quality because (a) the bids an publicly available in the grain industry do not necessarily represent transaction pr grain prices represent heterogeneous transactions in terms of quantity, quality, transp mode, timing of delivery, etc., (c) an average or median price of reported price ran not be meaningful, (d) given an index composed of several prices, a change in only or ceteris paribus, will change the index, (e) the cash settlement method may prc incentive to misrepresent or manipulate prices comprising the index.

---

[1] Associate Professor, Graduate Research Assistant, and Associate Professor, respe Department of Agricultural Economics, University of Illinois, Urbana-Champaign.

2. Cash settlement is not conducive to an industry which has high search and report costs, which may be the case in the grain industry.

3. The delivery settlement system increases cash market efficiency by creating an additional market which reveals supply/demand fundamentals at low search and negotiation costs.

4. Cash and carry arbitrage risk may increase under cash settlement.

5. Hedging cost may increase under cash settlement because a spot market position must be offset at the end of the hedge as opposed to having the option to delivery under the current system.

The validity and/or significance of individual points mentioned above are open to debate. Paul (1985), for example, presents many arguments in favor of cash settlement.

In addition to the "economic arguments" for or against cash settlement, there may be "lobbying or political realities" which are critical. For example, many of the strong proponents for the change to cash settlement in feeder cattle futures were large hedgers while the delivery yards tended to oppose the change. (Leuthold and Paul (1987) provide good reviews of cash-settlement issues and studies regarding livestock.) With respect to grains, an important political issue is whether an effective pro-lobby group for cash settlement could form. Unlike the feeder cattle industry, the large grain hedgers are, to a great extent, the same firms as those owning the delivery warehouses. Thus, if economic profits accrue from the warehouse ownership, it may be difficult to find a group of large hedgers who would advocate a change away from the delivery system. This is not to say that other effective lobbying groups could not form (e.g., firms or associations representing smaller hedgers); however, the natural lobbying division that existed in the feeder cattle industry is not apparent in the grain industry.

Despite all of the theoretical, logical, or anecdotal evidence about grain cash settlement, little empirical attention has been given to the issue. Lee and Schrader examine cash settlement for soybeans. (Some of their results will be reported in this paper.) And it will be argued later that the Pirrong et al. results may well indicate the feasibility of cash settlement using Chicago, Toledo, and St. Louis prices as an index. However, a thorough empirical investigation has not been completed to date.

This paper presents preliminary results of an ongoing study of cash settlement for corn and soybeans. The methodology is described in the next section, followed by a discussion of the results. Some concluding remarks are then offered.

Methodology and Data

The focus of the present analysis is on whether indices can be developed from cash prices which provide "good" hedging instruments. Two similar approaches are used to evaluate the hedging performance of an index. The first approach is similar in concept, for example, to Kimle and Hayenga and to Lee and Schrader, where the variability of a futures-cash basis is compared to the variability of an index-cash basis. The second approach makes the same type of variability comparison, but with basis forecast errors.

Under the first approach, the variance of the futures basis (FB) for a given commodity (corn or soybeans) and cash location is:

$$VAR(FB) \equiv VAR(F_T - C_T) \quad (1)$$

where VAR is the variance function; F_T is the closing futures price on the Thursday before expiration during expiration months March, May, and July for corn, and January, March, May and July for soybeans; and C_T is cash price at one of ten locations. The time period is January 1981 through December 1991. The variance of the index basis (IB) for a particular index is:

$$VAR(IB) \equiv VAR(I_T - C_T) \quad (2)$$

where I_T is a simple average of cash prices. Fourteen price combinations (indices) are considered. Inferences about the ability to hedge with a cash index are made by comparing VAR(FB) to VAR(IB).

The second approach allows for the possibility that the VAR(FB) or VAR(IB) may overstate basis risk if some of the change being reflected in the variance is predictable. Therefore, the variance of the difference between expected basis, E[B], and realized basis, R[B], is estimated. For the futures basis:

$$VAR(FB_e) \equiv VAR({}_{T\text{-}i}E[F_T - C_T] - (F_T - C_T)) \quad (3)$$

where FB_e is the futures basis forecast error; and i is the length of the forecast in weeks (i=4,8).

Likewise,

$$VAR(IB_e) \equiv VAR({}_{T\text{-}i}\, E[I_T - C_T] - (I_T - C_T)) \quad (4)$$

where IB_e is the forecast error associated with a particular index basis. The relative performance of the index as a hedging instrument is reflected by the size of $VAR(IB_e)$ compared to $VAR(FB_e)$.

Expectation models used for equations (3) and (4) are based on explicit information provided by the futures market. It is assumed that the expected futures price is the current futures price; that is, the hedger believes that the futures price is unbiased. The expected cash price is the current cash price adjusted according to the storage rate of return implied by the spread between the nearby and next nearby futures prices. These resulting expectations models can be expressed as:

$$
\begin{aligned}
{}_{T\text{-}i}\, E[F_T] &= F_{T\text{-}i} \\
{}_{T\text{-}i}\, E[C_T] &= C_{T\text{-}i}\, \exp(ry) \\
{}_{T\text{-}i}\, E[I_T] &= I_{T\text{-}i}\, \exp(ry)
\end{aligned}
$$

where exp is the exponential function; y is i/52; and r is ln(F**/F*) (12/n), where F** is the next nearby futures price at time T-i, F* is the nearby futures price at time T-i, and n is the number of months between F** and F*.

The cash markets considered are Minneapolis, Chicago, northern Illinois, southern Illinois, St. Louis, New Orleans, Toledo, eastern Ohio, western Ohio, and Cincinnati. Cash bids for northern and southern Illinois and for St. Louis are from the Illinois Agricultural Marketing Service. Prices for eastern and western Ohio and for Cincinnati were supplied by Dean Baldwin, Ohio State University (Baldwin and Dayton). Prices for Minneapolis, Chicago, Toledo, and New Orleans are from USDA.

Results

Corn

Table 1 presents VAR(FB) and VAR(IB) estimates for corn. The index for this case includes all ten cash markets. The basis variability is calculated at seven of the 10 locations. The variances of the forecast errors are also presented.

The first two columns of Table 1 indicate that, in general, the basis of the ending variance (Thursday before expiration) is much smaller for the index than for futures. The same general decline in variance is exhibited for the forecast errors (last two columns).

Table 2 summarizes and highlights the results in Table 1 by focusing on the ratio VAR(FB)/VAR(IB) and on $VAR(FB_e)/VAR(IB_e)$. The futures variance and respective index variance are significantly different at the 5% level (F test) if the ratio is greater than approximately 1.8. Three groups of comparisons are made: (I) VAR(FB) to VAR(IB), (II) $VAR(FB_e)$ to $VAR(IB_e)$ for the four-week forecast, and (III) $VAR(FB_e)$ to $VAR(IB_e)$ for the eight-week forecast. For each group, selected ranges of the variance ratios are defined, and the locations falling in each range are identified.

Except for Minneapolis in Group II, all of the ratios are above the critical 1.8 level. As expected, the ratios tend to drop from Group I to Group II and from Group I to Group III, indicating that when expectations are accounted for, the difference in basis "risk" between futures and the index declines.

An interesting comparison involves the cash locations' relative rankings (in terms of variance ratio level) within each group, and how their rankings change across groups. The implied hedging benefit from changing to the index for a particular location can be assessed relative to the other locations by comparing the ratio levels. These relative benefits may change depending on how the variance ratio is measured. The variance ratios for northern Illinois and St. Louis are in the highest range of each group. Thus, regardless of how variance reduction is measured, the implied risk reduction is high for northern Illinois and St. Louis when compared to the other locations. On the other hand, the relative benefit changes considerably for Toledo and Chicago, which have variance ratios in the third range of Group I, second range of Group II, and first range of Group III. This may suggest that the expectation models for the delivery locations should be based more on convergence during delivery than on the method used here. The Gulf ratio is in the second range for each group, while the Minneapolis ratio drops in its relative position, particularly from Group I to II.

Taken together, the results of Tables 1 and 2 strongly suggest a significant reduction in basis risk associated with the all-location cash index when compared to the basis risk associated with the futures price. (An important caveat to this conclusion will be discussed later.) However, the reduction for a particular location relative to other locations may change depending on the approach used to measure basis risk.

Tables 3a and 3b present the $VAR(IB_e)$ estimates for alternative index specifications. These comparisons allow an assessment of the hedging performance of alternative indices relative to the all-location index.

Table 3a presents the variance results for indices which exclude large areas (Illinois and Ohio) and for indices which exclude individual locations (Gulf, Minneapolis, Chicago, and Toledo). For comparison, variance results using the futures price and the all-location index are also presented. The size of each index variance relative to the all-location variance is designated by superscripts. A "++" superscript indicates that the variance is at least 1.8 times the all-location variance. A "+" indicates that

Table 1. Variances of Corn Ending Bases and of Basis Forecast Errors

	Ending Variance			VAR(E[B] - R[B])	
Cash Location	Futures	All Location Index	Weeks to Expiration	Futures	All Location Index
Northern Illinois	59.8	9.7	4	26.0	7.9
			8	51.6	14.3
Minneapolis	80.7	27.7	4	27.0	25.0
			8	82.9	39.6
Chicago	36.9	17.5	4	16.8	7.4
			8	35.8	8.8
Gulf	64.0	20.5	4	25.2	12.8
			8	45.1	21.4
Toledo	34.1	19.2	4	22.1	9.2
			8	49.6	13.1
St. Louis	59.8	9.2	4	27.7	5.0
			8	51.4	13.6
East Ohio	71.9	38.1	4	56.3	26.0
			8	81.1	38.0

Table 2. Corn Variance Ratios

Group I VAR(FB)/VAR(IB)	Group II $VAR(FB_e)/VAR(IB_e)$ 4-week forecasts	Group III $VAR(FB_e)/VAR(IB_e)$ 8-week forecasts
6.2 - 6.5: N. Ill, St. Louis	3.3 - 5.5: N. Ill, St. Louis	3.6 - 4.1: N. Ill., St. Louis, Toledo, Chicago
2.9 - 3.1: Gulf, Minn.	2.0 - 2.4: Gulf, E. Ohio, Chicago, Toledo	2.1: Minn., Gulf, E. Ohio
1.8 - 2.1: Toledo, E. Ohio, Chicago	1.1: Minn.	

Table 3a. Variances of Corn Basis Forecast Errors Alternative Index Specifications.

Cash Location	Weeks to Expiration	Futures	All Location Index	w/o IL	w/o OH	w/o Gulf	w/o Minn.	w/o Chicago	w/o Toledo
Northern Illinois	4	26.0	7.9	12.3^{+}	6.8	7.7	8.9	7.9	7.5
	8	51.6	14.3	24.9^{+}	7.0^{--}	15.0	19.1^{+}	15.4	12.7
Minneapolis	4	27.0	25.0	26.3	18.5^{-}	25.8	30.8	25.5	24.0
	8	82.9	39.6	54.9^{+}	21.7^{--}	39.9	48.3	41.2	36.9
Chicago	4	16.8	7.4	11.4^{+}	6.5	7.7	8.0	9.1	7.3
	8	35.8	8.8	19.9^{++}	7.8	8.9	11.1	10.9	8.2
Gulf	4	25.2	12.8	15.0	9.6^{-}	15.8	13.8	13.0	12.3
	8	45.1	21.4	31.5^{+}	18.0	25.9	21.5	21.7	20.9
Toledo	4	22.1	9.2	7.1^{-}	18.3^{++}	8.6	8.5	9.1	11.4
	8	49.6	13.1	8.4^{-}	31.5^{++}	12.9	10.6	12.4	16.2
St. Louis	4	27.7	5.0	8.5^{+}	6.0	5.6	4.5	5.0	4.7
	8	51.4	13.6	25.2^{++}	10.7	16.0	14.4	14.0	13.0
East Ohio	4	56.2	26.0	21.5	43.0^{+}	23.6	23.4	25.1	27.7
	8	81.1	38.0	25.9^{-}	70.7^{++}	35.5	33.0	26.5	39.7

"+" indicates that the variance is between 1.3 and 1.8 times the all-location index variance; "++" means it is at least 1.8 times all-location variance; "−" means that the all-location variance is between 1.3 and 1.8 times the variance; "−−" means that the all-location variance is at least 1.8 times the variance.

Table 3b. Variances of Corn Basis Forecast Errors for Alternative Index Specifications.

Cash Location	Weeks to Expiration	Futures	All Location Index	Terminals	Chicago & Toledo	Gulf	St. Louis & Gulf	Toledo & Gulf	Toledo & St. Louis & Chicago
Northern Illinois	4	26.0	7.9	9.2	14.2^{++}	22.8^{++}	13.9^{+}	15.4^{++}	10.7^{+}
	8	51.6	14.3	14.3	21.6^{+}	39.0^{++}	29.9^{++}	40.1^{++}	19.0^{+}
Minneapolis	4	27.0	25.0	21.8	31.6	32.1	31.6	30.9	31.0
	8	82.9	39.6	36.6	49.8	66.2^{+}	56.3^{+}	73.1^{++}	46.3
Chicago	4	16.8	7.4	6.5	4.5^{-}	19.2^{++}	12.9^{+}	11.6^{+}	4.8^{-}
	8	35.8	8.8	7.2	7.4	28.6^{++}	20.8^{++}	34.4^{++}	7.5
Gulf	4	25.2	12.8	10.0	19.1^{+}	0.0^{--}	3.1^{--}	7.0^{--}	14.4
	8	45.1	21.4	15.9^{-}	27.2	0.0^{--}	3.3^{--}	25.7	18.7
Toledo	4	22.1	9.2	9.1	4.5^{--}	28.0^{++}	20.1^{++}	7.0^{-}	6.7^{-}
	8	49.6	13.1	14.0	7.2^{--}	33.6^{++}	30.3^{++}	8.4^{-}	11.4
St. Louis	4	27.7	5.0	5.2	11.2^{++}	12.4^{++}	3.1^{-}	8.4^{+}	5.0
	8	51.4	13.6	9.9^{-}	19.4^{+}	13.1	3.3^{--}	28.2^{++}	9.0^{-}
East Ohio	4	56.3	26.0	32.0	27.1	60.9^{++}	45.0^{+}	34.2^{+}	27.3
	8	81.1	38.0	48.8	41.7	78.8^{++}	73.8^{++}	49.4^{+}	48.3

* See Table 3a for superscript definitions.

it is between 1.3 to 1.8 times the all-location variance. Thus, a variance designated with a "+" or "++" suggests that the respective index performs worse than the all-location index for that location. The "-" and "--" superscripts mean that the variance of the all-location index is at least 1.3-1.8 times and 1.8 times the index variance, respectively, implying that the index comprised of fewer locations performs better than the all-location index.

Not surprisingly, Table 3a indicates that the elimination of Illinois cash prices from the index causes the basis risk to increase at northern Illinois, Chicago, and St. Louis. The Minneapolis and Gulf risk also increases, particularly for the eight-week forecast scenario. The implied basis risk in the eastern corn belt (east Ohio, Toledo) decreases with the removal of Illinois from the index. When Ohio prices are taken out of the index, the Ohio variances increase significantly while the Northern Illinois, Minneapolis, and St. Louis variances decrease significantly. However, there is no significant change in the Chicago and Gulf variances.

As would be expected, the removal of all prices in the index from a fairly large area will cause basis risk to increase in that area. The remainder of Table 3 focuses on the impacts of eliminating just one location from the index. In general, the impact is small. For example, when the Gulf price is eliminated, the resulting variances are not significantly different than the all-location variances, and the ratios are always less than 1.3. This is true even for the variance at the Gulf. Likewise, when Chicago, Toledo, or Minneapolis prices are individually taken out of the index, the increase in variance at these locations is relatively small. Thus, the general conclusion here is that the price effect of one location on the ten-price (all-location) index is not great.

Table 3b presents variances associated with additional indices, with particular emphasis on terminal price combinations. "Terminal" locations are defined here as Chicago, Toledo, Cincinnati, St. Louis, Minneapolis, and the Gulf. The all-location index is used again as a reference point.

The index which includes all six terminal locations performs well relative to the all-location index. In most cases, the variance is slightly smaller or slightly larger than the all-location index. For the Gulf and St. Louis, the variance is significantly lower; for East Ohio, it is significantly higher. When including only one or two terminal locations in the index, the index performs relatively poorly for all of the locations not included in the index. For example, if the index is composed of only the Gulf price then the variance associated with the Gulf location is zero, but the variances for all other locations are much greater than the all-location index. This general result is also implied by the three two-location variances. On the other hand, the three-terminal index comprised of Toledo, St. Louis, and Chicago provides a fairly good index for most locations.

It is worthwhile at this point to diverge somewhat and discuss the similarities between the finding that the Chicago/St. Louis/Toledo index performs well and the Pirrong et al. results (pp. 156-163). Pirrong et al. consider three delivery systems: (1) the use of Chicago and Toledo with existing discounts, (2) the use of Chicago and Toledo without a Toledo discount, and (3) the use of Chicago, Toledo, and St. Louis with no Toledo discount and a ten cent St. Louis premium. Based on option pricing theory, a "synthetic" futures price is found under each hypothetical delivery system. In short, the synthetic futures is estimated by a weighted average of the three deliverable prices (including discounts and premiums), adjusted for time value. The weights are determined by estimated parameters of a joint distribution, the relative cash prices, and the discounts/premiums. For a particular hedging location (eight are considered), the hedging effectiveness of a delivery system is assessed by regressing the percentage change in cash price on the percentage change in synthetic futures price. The general conclusion is that a delivery system including St. Louis (with a 10¢ premium) performs better than the other two delivery systems.

An interesting issue involves the relationship between the synthetic futures price and our cash price index. If the two are highly correlated, then there may be little gain by using a St. Louis/Toledo/Chicago index over a delivery system which includes St. Louis at a ten cent premium and Toledo at par. Given (1) the high degree of correlation between St. Louis, Chicago, and Toledo prices and (2) the discounts are "representative" of the cash market, our guess is that the weights underlying the synthetic futures price are often approximately equal. Under the "economic par" system, as investigated by Pirrong et al., it is therefore not surprising that adding St. Louis would increase hedging performance considerably, given our findings with respect to simple average indices.

The issue of the relationship between a synthetic futures price and a cash settlement index also highlights an important caveat to cash settlement studies. The estimation of a synthetic futures price is an attempt to account for or quantify the change in structure caused by specifying a different delivery system. A change in delivery specification implies a change in what the futures price represents. Likewise, a change to cash settlement means that the futures price will converge to the index at the time of settlement. A critical question for cash settlement studies is whether this change in the pricing of futures contracts would cause significant changes in cash price behavior, and if so, are the cash settlement results estimated under the "old" structure valid? Although we will leave this issue to future research, the answer likely hinges on the degree to which individual cash prices are determined solely by cash-market forces rather than through reference to the contemporaneous futures price.

Soybeans

The results for soybeans are in Tables 4 through 6. Table 4 presents the ending variances and forecast variances for our sample period as well as the ending variances found by Lee and Schrader for all expiration months during 1984-90. The general finding from both sets of ending variances is that, as with corn, the index variance is less than the futures variance. An exception to this general finding, particularly in Lee and Schrader's results, is with respect to Chicago and Toledo. The Lee/Schrader Chicago index variance is about 1.5 times the futures index and the Toledo variances are about equal. Our ending-variance results suggest that the Chicago and Toledo futures variances are higher than the index variances, but that the relative difference between the futures and index variances is usually smaller for Chicago and Toledo than for other locations. The Lee/Schrader results regarding Chicago and Toledo fits our prior expectations better than our results—i.e, one would expect that the ending basis variance at an active delivery location would be less than an index basis variance. It is not clear at this point whether our results differ from Lee and Schrader's because of (1) different periods of study, (2) different expiration months, (3) different trading days (last day or three days of trading (Lee and Schrader) versus our last Thursday), or (4) none of the above. The basis observations associated with the July 1988 contract are unusually large in absolute terms. When these are excluded, the Chicago ending variance for futures decline from 51.6 to 40.5, and the respective all-location index variance increases slightly. Nonetheless, the same directional discrepancy between the two studies persists.

Table 5 summarizes the ratios of the Table 4 variances. As with corn, the ratios associated with northern Illinois and St. Louis are always in the highest range, regardless of whether the ending variance, four-week forecast variance, or eight-week forecast variance is considered. Minnesota and the Gulf are always in the second highest range, and Chicago is always in the lowest range. Therefore, unlike corn, the relative rankings among the locations do not in most cases depend on the type of variance measured. Toledo is an exception. Its variance ratio is in the lowest range for Group I, second lowest for Group II, and highest for Group III.

Table 4. Variances of Soybean Ending Bases and of Basis Forecast Errors

	Lee & Schrader			Ending Variance		VAR(E[B] - R[B])		
Cash Location	Futures	Simple Index	Weighted Index	Futures	All Location Index	Weeks to Expiration	Futures	All Location Index
Northern Illinois	104.4	25.6	26.1	120.1	21.3	4	88.4	20.6
						8	116.0	28.6
Minneapolis	108.9	56.8	68.4	122.6	41.9	4	103.6	32.3
						8	124.4	40.0
Chicago	35.6	53.4	57.1	51.6	33.7	4	22.0	18.3
						8	57.6	41.6
Gulf	144.1	59.4	50.3	115.2	37.8	4	96.1	29.1
						8	126.3	43.3
Toledo	65.1	63.7	63.2	65.5	28.8	4	57.9	20.4
						8	100.9	23.4
St. Louis	157.8	40.9	41.7	94.2	16.2	4	76.8	20.5
						8	106.7	26.4
East Ohio	NA	NA	NA	126.3	92.2	4	40.6	47.7
						8	123.1	51.0

Table 5. Soybean Variance Ratios

Group I VAR(FB)/VAR(IB)	Group II $VAR(FB_e)/VAR(IB_e)$ 4-week forecasts	Group III $VAR(FB_e)/VAR(IB_e)$ 8-week forecasts
5.6 - 5.8: N. Ill., St. Louis	3.7 - 4.3: St.Louis, N. Ill.	4.0 - 4.3: St. Louis, N. Ill., Toledo
2.9 - 3.0: Minn., Gulf	3.2 - 3.3: Minn,, Gulf	2.9 - 3.1: Gulf, Minn.
1.4 - 2.3: E. Ohio, Chicago, Toledo	2.8: Toledo	2.4: E. Ohio
	0.9 - 1.2 : E. Ohio, Chicago	1.4: Chicago

Table 6a. Variances of Soybean Basis Forecast Errors for Alternative Index Specifications.[a]

Cash Location	Weeks to Expiration	Futures	All Location Index	w/o IL	w/o OH	w/o Gulf	w/o Minn	w/o Chicago	w/o Toledo
Northern Illinois	4	88.4	20.6	35.0^{+}	14.3^{-}	20.6	23.1	20.1	14.3^{-}
	8	116.0	28.6	46.7^{+}	18.8^{-}	28.7	32.3	28.8	27.4
Minneapolis	4	103.6	32.3	40.3	25.5	32.3	39.2	31.9	31.8
	8	124.4	40.0	47.9	33.7	37.5	49.5	40.7	38.9
Chicago	4	22.0	18.3	26.7^{+}	26.4^{+}	15.6	17.9	22.7	27.7^{+}
	8	57.6	41.6	61.2^{+}	38.1	40.6	42.3	51.6	41.1
Gulf	4	96.1	29.1	22.4^{-}	35.0	36.0	29.0	27.1	40.8^{+}
	8	126.3	43.3	51.0	43.3	52.2	39.9	43.4	42.8
Toledo	4	57.9	20.4	14.1^{-}	40.1^{++}	18.7	21.1	20.7	32.7^{+}
	8	100.9	23.4	17.5^{-}	42.3^{++}	22.9	22.3	23.2	29.0
St. Louis	4	76.8	20.5	34.8^{+}	14.4^{-}	22.7	20.9	20.7	21.0
	8	106.7	26.4	40.3^{+}	26.1	26.3	26.7	25.3	26.2
East Ohio	4	40.6	47.7	40.5	79.0^{+}	43.8	43.1	50.7	64.1^{+}
	8	123.1	51.0	37.8^{-}	77.7^{+}	50.6	49.3	51.6	52.7

[a] See Table 3a for superscript definitions.

Table 6b. Variances of Soybean Basis Forecast Errors for Alternative Index Specifications.[a]

Cash Location	Weeks to Expiration	Futures	All Location Index	Terminals	Chicago & Toledo	Gulf	St. Louis & Gulf	Toledo & Gulf	Toledo & St. Louis & Chicago
Northern Illinois	4	88.4	20.6	28.4^{+}	39.6^{++}	66.8^{++}	34.4^{+}	47.7^{++}	28.1^{+}
	8	116.0	28.6	36.9	54.2^{++}	84.7^{++}	52.9^{++}	59.7^{++}	44.4^{+}
Minneapolis	4	103.6	32.3	30.2	43.3^{+}	64.0^{++}	43.5^{+}	44.7^{+}	37.8
	8	124.4	40.0	40.6	61.1^{+}	117.6^{++}	74.7^{++}	79.4^{++}	52.6^{+}
Chicago	4	22.0	18.3	21.6	9.6^{--}	65.0^{++}	36.1^{++}	40.0^{++}	10.1^{--}
	8	57.6	41.6	35.5	17.3	91.0	67.8	72.7	27.6
Gulf	4	96.1	29.1	24.7	46.2^{+}	0.0^{--}	14.9^{--}	11.7^{--}	42.0^{+}
	8	126.3	43.3	41.6	63.4^{+}	0.0^{--}	18.4^{--}	28.8^{-}	55.8
Toledo	4	57.9	20.4	19.7	9.6^{--}	46.6^{++}	38.5^{++}	11.7^{-}	17.8
	8	100.9	23.4	21.0	17.6^{-}	21.5	44.2^{++}	17.9^{-}	18.5
St. Louis	4	16.8	20.5	19.5	39.1^{++}	59.6^{++}	14.9^{-}	68.2^{++}	17.4
	8	106.7	26.4	25.3	49.7^{++}	73.7^{++}	18.4^{-}	49.8^{++}	22.1
East Ohio	4	40.6	47.7	58.5	40.0	84.7^{+}	71.1^{+}	59.7	47.0
	8	123.1	51.0	60.1	59.2	98.8^{++}	80.4^{+}	62.6	61.3

[a] See Table 3a for superscript definitions.

It is noteworthy that the Chicago variance ratio is 1.53, 1.2, and 1.4 for Group I, II, and I] respectively. Thus, while the futures variances are greater than their respective index variances, tl difference is not statistically significant at the 5% level (requiring a ratio of about 1.8).

Tables 6a and 6b focus on the variances of soybean basis forecast errors resulting from alternati index specifications. The general implications of Tables 6a and 6b are the same as those of Tables : and 3b for corn, and can be summarized by (1) the removal of large geographical areas (states) from tl index significantly worsens the index's hedging performance for locations within the eliminated area, (removal of individual locations does not appreciably change the index performance, even for tl eliminated location, (3) the all-terminal index performs relatively well, (4) the one- and two-locati indices do not perform well relative to the all-location index, and (5) the Toledo-St. Louis-Chicago ind performs relatively well.

Concluding Remarks

The results of this preliminary analysis strongly suggest that basis risk can be decrease considerably at most locations by using a cash settlement index. The ten-location index works well. Th removal of an individual location from this index creates little loss in hedging performance. The si location index comprised of terminal prices also performs well.

There are many additional empirical issues which could be considered when evaluating th desirability of cash settlement for grains. A few include (1) consideration of other location possibiliti for the index and for assessing hedging performance, (2) consideration of other price weighting scheme for the index, (3) the effect of new-crop contracts, (4) the hedging performance for hedges lifted befor expiration month, (5) the potential and ability of index manipulation, and (6) the benefit of cas settlement relative to delivery systems which are not being used today. There are other theoretic arguments, particularly regarding the effect on cash-market performance, which would be difficult t study empirically. However, the results of the present analysis indicates that cash-settlement alternative should not be dismissed out of hand.

References

Baldwin, E. D. and J. Dayton. Documentation for Grain Marketing Basis Analysis Program (GMBA) Extension Bulletin 755. Ohio Cooperative Extension Service, the Ohio State University, 1987.

Commodity Futures Trading Commission, Division of Economic Analysis. An Analysis of the Delivery Point Provisions of the Chicago Board of Trade's Corn, Wheat and Soybean Futures Contracts September 1991.

Kimle, K. and M. Hayenga. "Developing a Cash Settlement Price Index for Live Hog Futures." NCR-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. pp. 341-357, 1991.

Lee, J. S. and L. F. Schrader. "Impact of Cash Settlement on Basis Variation for Soybean Futures Contracts." AAEA Selected Paper Presentation, Manhattan, KS, August 1991.

Leuthold, R. M. "Cash Settlement versus Physical Delivery: The Case of Livestock." The Review of Futures Markets. 10(1991), forthcoming.

Paul, A. B. "Pricing Implications of Alternative Delivery Mechanisms for Futures Contracts." in Key Issues in Livestock Pricing: A Perspective for the 1990s. W. D. Purcell and J. B. Rowsell, eds. Blacksburg, VA: Research Institute on Livestock Pricing. pp. 55-94, 1987.

Paul, A. B. "The Role of Cash Settlement in Futures Contract Specification" in Futures Markets: Regulatory Issues. A. E. Peck, ed. Washington, D.C.; American Enterprise Institute for Public Policy Research. pp. 271-328, 1985.

Peck, A. E. and J. C. Williams. An Evaluation of the Performance of the Chicago Board of Trade Wheat, Corn, and Soybean Futures Contracts During Delivery Periods, a Report to the National Grain and Feed Association. April 1991.

Pirrong, S. C., D. Haddock, and R. Kormendi (with M. Brennan, M. Miller, R. Roll, H. Stall, and L. Telsen). Grain Futures Contracts: An Economic Appraisal. Mid America Institute for Public Policy Research, July 15, 1991.

U. S. Department of Agriculture, Agricultural Marketing Service. Grain and Feed Market News. Washington, D.C.: U. S. Govt. Printing Office, 1980-1991, various issues.