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Futures Spread Risk in Soybean Hedge-to-Arrive Contracts

E. Neal Blue[1], Marvin Hayenga[2], Sergio Lence[2], and E. Dean Baldwin[3]

In the 1995/96 crop year, record high corn futures prices and inverted spreads eroded the cash flows and financial capabilities of both farmer hedgers and elevators who implemented the rollover provisions in hedge-to-arrive (HTA) contracts. Participants in the 1995/96 corn market who used the exotic HTA multiple-year mechanism faced large unexpected margin calls and/or sharply lower "net" prices than expected, as the July-December old crop-new crop inverted corn spread widened to very large negative levels. We evaluate the soybean futures spreads in the 1948-1997 period, and the associated monetary risks inherent in the rollover provisions of the HTA contracts. In the 50 years in which current soybean May, July, and November contracts have been trading, the probability of old crop-new crop spreads being in the plus/minus 10 percent range of the old crop "normal" price was approximately 75 percent and the probability of having negative spreads exceeding 10 percent was only 20 to 25 percent. However, the high-price years (over 20 percent above normal old crop price) had a 100 percent probability of having a negative spread and a 50 to 60 percent probability of having a negative spread exceeding 10 percent. Merchandisers offering HTA contracts should be aware of these risks and communicate them to farmers considering their HTA contracts.

Introduction

Corn and soybean hedge-to-arrive contracts (HTA) have been in use in the Midwest since the 1980s. The HTA is a cash marketing contract that offers grain producers an opportunity to lock in a referenced futures price when it is considered attractive. This typically occurs when current futures prices are higher than recent experience, usually in short-crop years. With a HTA, the grain merchant hedges the grain in the futures market, specifies a date for the delivery of grain by the farmer to the merchant, and allows the farmer to fix the basis prior to or on the day of delivery.

By the late 1980s, some innovative merchants modified the HTA contract so that the farmer could roll the HTA contract into a later month or year. When futures prices rose to unusually attractive levels some farmers wanted to lock in these unusual price and profit levels for more than one crop year. Typically, the HTA contracts were set up by grain merchants to allow grain producers to establish sales prices in future years at or near the futures prices in the current crop marketing year. The rollover feature was considered an advantage for the farmer worried about the risk of poor growing conditions in one year and not being able to deliver the contracted volume. HTA contracts have been employed by corn, soybean, and wheat merchandisers in the last decade.

In the short crop year of 1995/96, record high corn futures prices and inverted spreads eroded the cash flows and financial capabilities of both farmer hedgers and elevators who implemented the rollover provisions in HTA contracts. Participants in the 1995/96 corn market who used the exotic HTA multiple-year mechanism faced large unexpected margin calls and/or sharply lower "net" prices than expected, as the July-December old crop-new crop spread inverted to very large negative levels. Participants used several mechanisms to adjust to the unusually wide inverted spread including (a) rolling the contracts forward from one delivery month to the next; (b) closing out of the current position; (c) "unpricing" or closing out the

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current position with the expectation that a hedged position would be reset at a later date; (d) breaking the legal contract; and (e) sometimes imposing changes in the contract.

Because both merchants and farmers lost large sums of money and contracts were often broken, much litigation is proceeding through the court system. In the litigation, there are two key questions:

What are the spread risks involved in HTA contracts?

2. Did the elevators/merchandisers adequately disclose the spread risks to the farmers who used the HTAs?

Also, the Commodity Futures Trading Commission (CFTC) is re-examining their regulatory position and is establishing new guidelines for these cash contracts (*CFTC Advisory #3911-96).*

Objectives

To shed some light on the two key questions posed above, we propose to evaluate the futures price spreads and associated monetary risks inherent in the rollover provisions in HTA contracts. We focus on soybeans, where HTAs have been used.[4]

Previous Literature

Some analyses of multiple year hedging have been published (Conley, Kahn, and Almonte-Alvarez; Gardner). Conley, Kahn, and Almonte-Alvarez evaluated two-year hedges using December-to-December corn futures hedges for the 1973-95 period. They found that the average net price using the two-year hedging program was no better than cash sales at harvest or a simple annual hedge set in May. Also, the risk associated with the two-year hedge was found to be higher than for annual hedging.

Gardner evaluated multiple year rollover hedging in corn, soybeans, and cotton to assess why there was no multi-year futures market. In his analysis, the initial hedge was started on May 1 and was rolled over on October 15 of each year, thereafter. The futures contracts used in his analysis were November for soybeans, and December for corn and cotton. Gardner found that sequential rollover hedging yielded the same expected returns as cash sales, annual futures sales, or a theoretically constructed multi-year futures contract. In addition, the transaction cost was highest for the rollover hedges.

A critical weakness of both studies, however, is their reliance on means and standard errors as a measure of risk *for all years* even though short crop-high price years, when HTAs are likely to be used, appear only a limited number of times. The small sample size used by Conley, Kahn, and Almonte-Alvarez and by Gardner may not provide enough observations about short-crop years to make reasonable inferences about the price behavior in situations when HTAs are likely to be used in larger volumes. Furthermore, neither study analyzed the typical practice used in rollover HTAs -- the initial placing of the hedge in old crop futures contracts, then rolling that position into a new crop futures contract.

The National Grain and Feed Association assessed rollover HTA contracts as very high risk contracts but did not evaluate such risk quantitatively. The risks associated with moving

[4] Corn HTA risks are being examined in another paper by Lence and Hayenga.

futures contracts from old crop to new crop positions are pointed out in the Chicago Board of Trade (CBOT) publication Understanding Basis, first printed in 1988 and reprinted in 1990. An inverted market is one where futures prices in distant delivery months are lower than (or at a discount to) prices of nearby futures contracts, as occurred in 1995-96 in corn futures contracts. This CBOT publication points out that an inverted market is infrequent. However, it also points out that such a situation is "...most likely to occur in a year of short supply. ... The futures price for the last delivery month of one marketing year may differ sharply from the futures contract for the first delivery month of the next marketing year" (p. 5).

These risks also have been pointed out in classic articles reprinted, published, and distributed by the CBOT since 1977 (Selected Writings of Holbrook Working, Selected Writings on Futures Markets Vol. II). Holbrook Working in his 1948 and 1953 articles found that "not infrequently prices in deferred futures markets are below that of the near future," showing that pattern of price behavior in the wheat market. The prices of deferred futures contracts were less than prices of nearby futures when the amount of grain in storage was low. This is the "spread" risk discussed in the HTA cases, and it was a well known risk in grain markets over 50 years ago.

Tomek and Gray discuss the limit to the positive price difference (spread) between two futures contracts. They offer a very important point for these cases when they say that there is "no practicable limit" to the negative price difference (spread) in a low inventory situation. While old crop and new crop futures prices usually will be positively and highly correlated, the spread will be inverse and large when current stocks are small and expected ending stocks in the new crop year will be much greater.

The CBOT publication entitled July/December Corn Spread 1982-1992 (p.2) also points out the risks. "How wide can the July-December corn spread get? Since corn that won't be available until December can't be used to relieve a shortage in July, there is no limit to how far July futures can trade above December futures. Spreads of 30 cents or more have not been uncommon."

The published literature cited above shows that the spreads between different storable commodity futures contract prices tend to be slightly positive in periods when there are normally incentives for storage (in the eight or so months after harvest). Similarly, when normal crops with adequate stocks, are followed by crops large enough to keep stocks from dropping much, the old crop-new crop spreads should not be large. The biggest old crop-new crop contract spread risk arises in the short crop-high price years. These, also, are the situations in which HTA contracts or related marketing contracts are most likely to be entered into by farmers.

Procedures to Characterize Old Crop-New Crop Spread Risk

The July-November and May-November old crop-new crop spreads are evaluated for the 1948-1997 period. Even though soybean futures contracts have been traded on the CBOT since 1936, the November soybean contract did not begin trading until 1948.

To characterize the interyear (or intercrop) spread risk in soybeans, scatter diagrams are created to show what happens to the old crop-new crop spread when the current futures price exceeds the "normal price level." The "normal price level" is defined as the most recent five-year moving average of the July (May) futures price for the July-November (May-November) analysis.[5] The five-year moving average price may be viewed as a proxy for the recent "normal"

[5] The use of the most recent moving five-year moving average price as a baseline allows one to

price experienced by a farmer, and as a way to adjust for the upward trend in prices over the last 50 years. When this year's price is substantially higher than that observed in recent history, producers are more likely to enter into multi-year contracts which may lock-in that elevated price level.

The July-November and May-November soybean futures spreads are calculated as:

Spread $_{N\text{-}J}$ = November futures midrange price in June minus July futures midrange price in June

Spread $_{N\text{-}M}$ November futures midrange price in April minus May futures midrange price in April

The month prior to the July or May soybean contract is used because this is a time when HTAs are likely to be rolled forward into successive or later contract delivery dates. Each monthly observation is the monthly midpoint of the highest and lowest prices (i.e., the midrange) in the month prior to the contract expiration. For example, for the July-November spread scatter diagram, the horizontal axis is the current year's July futures price taken in June as a percentage of the average July futures price in June over the previous five years. Similarly, the vertical axis is the July-November current futures spread as a percentage of the average July futures price in June over the previous five years. Each spread datapoint associated with a particular price is then plotted on the graph (see Figures 1 and 2). Descriptive statistics of spread differences in short crop-high price years and other years are presented in Table 1.

Results

Figures 1 and 2 are the scatter diagrams of the July-November and May-November spreads, respectively, for the 1953-1997 time period.[6] In both scatter diagrams the datapoints are clustered in northwest to southeast pattern. When the current year's May or July price begins to exceed 20 percent of the normal price there is a clear predominance of more and larger negative July-November and May-November spreads. This pattern is confirmed by price-spread correlations for the May-November and July-November data of -0.81 and -0.92, respectively.

Table 1 summarizes the May-November and July-November spread distributions. For the 1953-1997 period, 24 percent of the July-November spreads are positive, and the rest are negative. Twenty two percent of all years exhibit negative spreads exceeding 10 percent of the "normal" price, and 9 percent of all years had negative spreads exceeding 20 percent of the "normal" price.

From the 1953-1997 time period, the 10 highest July and May price years are selected to illustrate the spread differences in high price years when multiple year HTA contracts would be more attractive to grain producers. When only the high price years are evaluated, all of the spreads are negative, and approximately half of the spreads are larger (in absolute value) than -20 percent of the "normal" price. The extreme negative spread noted in 1973 was associated with a

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infer when the current price might be perceived as attractive. This attractive price could be used as a basis for contracting crops to be produced in the future.

[6] The analysis uses data spanning the 1948-1997 period. Because of the five-year moving average method used to generate the "normal" price, the generated datapoints begin in 1953

shortfall in fish meal production in South America, poor harvesting conditions in 1972, and Soviet Union grain purchases. Spreads in the 10 highest price years have mean values of -24 to -27 percent and median values of -13 to -18 percent. This translates into an actual spread range of approximately -$1.55 to -$1.75 per bushel at a mid-1990s price level of $6.56/bushel.

The data clearly show that as the July or May futures price exceeds the "normal" price there is a tendency for the July-November and May-November futures spreads to become more negative. Typically, high price years occur when a drought and low crop carryover has occurred. In such circumstances, the market forecast for the next crop year will be based on yield trends and normal weather assumptions until the middle of the growing season. This results in the market's expectation that a year following a high priced year will be a more "normally" priced year. The higher the price this year, the greater the difference between that price and the expected "normal" price next year. This expectation manifests itself in the market, where the new crop futures prices are discounted relative the old crop futures prices.

Conclusions

Can multiple-year HTAs be expected to result in net prices close to the initial futures price when the contract is signed? In the 50 years in which current soybean May, July, and November contracts have been trading, the probability of old crop-new crop spreads being in the plus/minus 10 percent range was approximately 75 percent and the probability of negative spreads exceeding 10 percent was only 20 to 25 percent. However, the 10 highest price years (over 20 percent above "normal" price) had a 100 percent probability of having a negative spread and a 50 to 60 percent probability of having a negative spread exceeding 10 percent.

While the soybean HTAs have not had the dramatic problems and associated litigation that corn HTAs have had, the 1973 spread suggests that such events can occur in the soybean market. The 24 percent spread noted in 1997 (-$1.97/bushel) is a more recent example that a significant old crop-new crop price inversion could happen for soybeans. Any merchandiser offering HTA contracts should be aware of these risks and communicate them to farmers considering their HTA contracts. The old crop-new crop spread risk in high price years makes a multi-year HTA contract a very imprecise "hedge," since it involves speculation on the size of the spread. These results provide supporting evidence for the Commodity Futures Trading Commission's characterization of multiple-year HTAs as 'speculative' contracts (see CFTC Advisory #3911-96, endnote #11).

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Table 1. Percentage of Occurrences of May-November and July-November Soybean Futures Price Spreads, 1953-1997.

Futures Price Spread Percentage Classes	May-November Spreads[a] All Years	May-November Spreads[a] 10 Highest[c] Priced Years	July-November Spreads[b] All Years	July-November Spreads[b] 10 Highest Priced Years
	percent of occurrences[d]			
Less than -100.01%	0	0	2	10
From -90.01% to -100%	0	0	0	0
From -80.01% to -90%	0	0	0	0
From -70.01% to -80%	2	10	0	0
From -60.01% to -70%	0	0	0	0
From -50.01% to -60%	0	0	0	0
From -40.01% to -50%	4	20	2	10
From -30.01% to -40%	0	0	0	0
From -20.01% to -30%	4	20	4	20
From -10.01% to -20%	13	10	13	10
From -0.01% to -10%	49	40	53	50
From 10% to 0%	27	0	24	0
Futures Spread Statistics				
Mean Spread (%)	7	-25	-9	-28
Median Spread (%)	-4	-18	-3	-13
Std. Deviation of Spread	16	25	24	46

Notes:

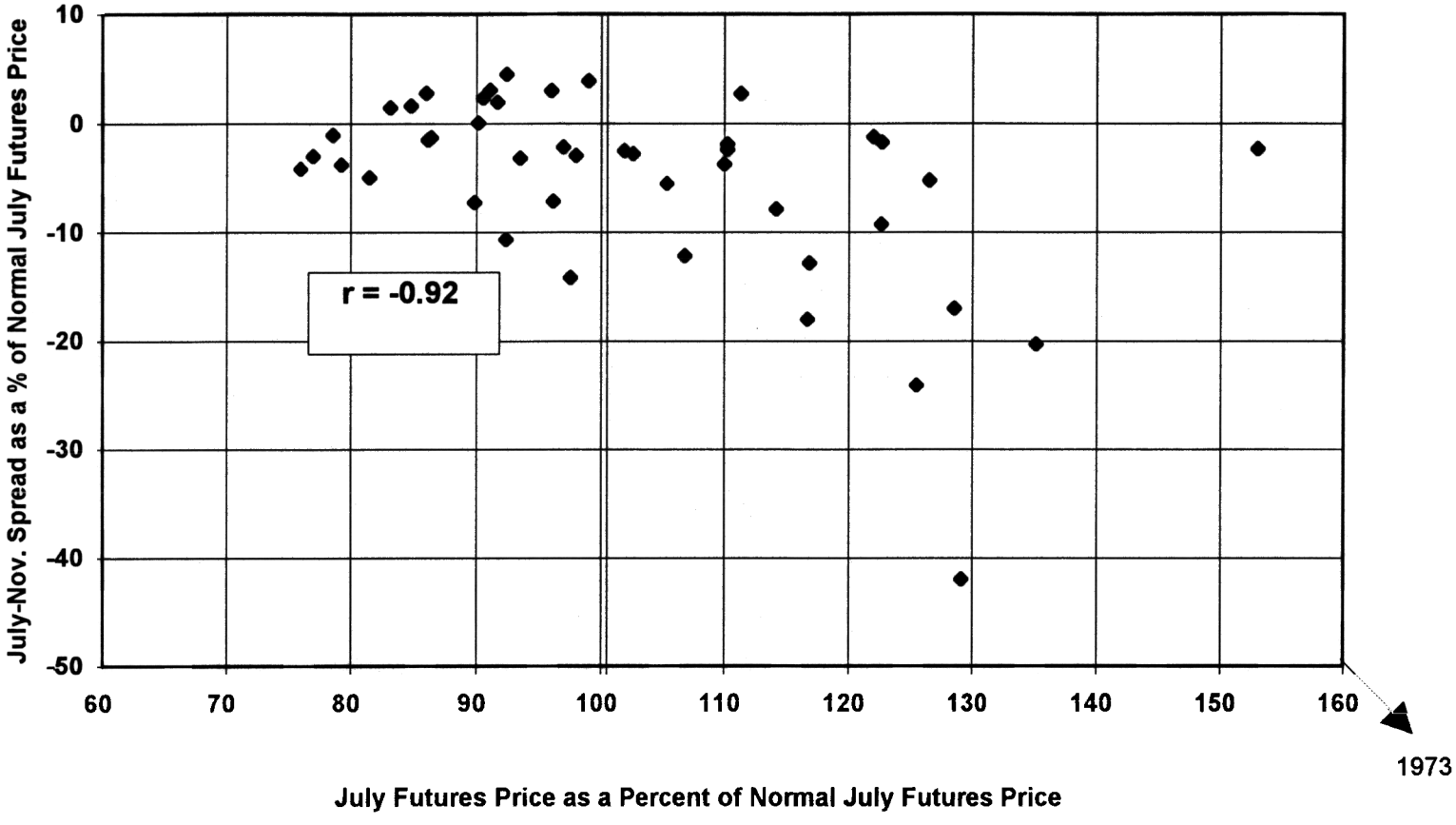
[a] The May-November futures price spread is expressed as a percentage of the average May soybean price in April in the previous 5 years.

[b] The July-November futures price spread is expressed as a percentage of the average July soybean price in June in the previous 5 years.

[c] The 10 highest priced years are the 10 years with the highest May (for the May-November spreads) or highest July (for the July-November spreads) prices.

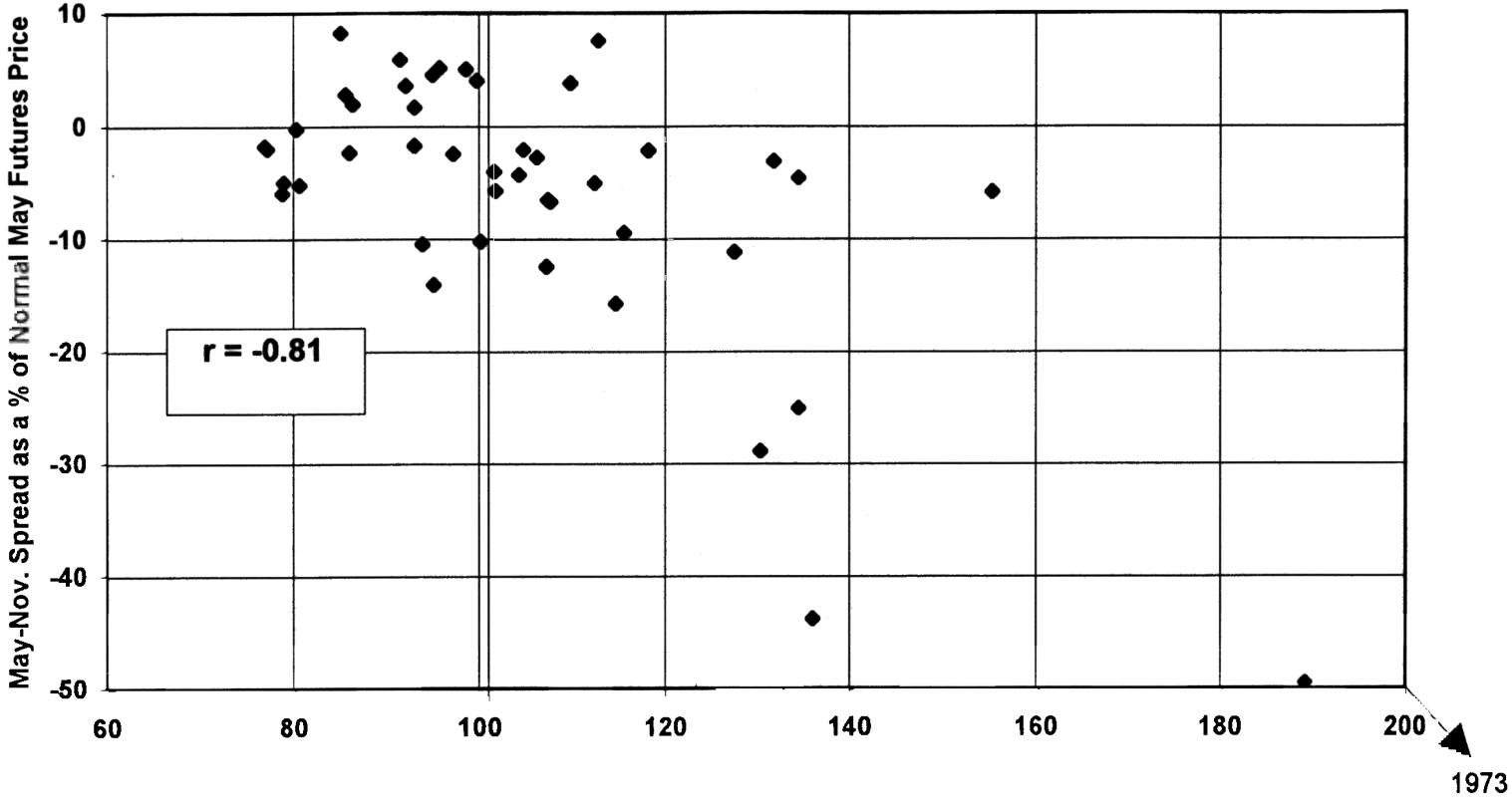
[d] All columns sum to 100 percent.

Figure 1. The July-November Soybean Futures Spread in June, 1953-1997.



Note: In 1973, the July futures price was 362% of the normal July futures price. The July-Nov. spread was -152% of the normal July futures price.

Figure 2. The May-November Soybean Futures Spread in April, 1953-1997.



Note: In 1973, the May futures price was 226% of the normal May futures price. The May-Nov. spread was -74% of the normal May futures price.