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Storage Hedging: What's a Merchandiser to Do?

Returns to Hedging for Central Oklahoma Wheat Elevators

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Elevator storage and merchandising capacity increased substantially during the 1970s and [illegible] reducing the amount of wheat stored and handled relative to storage and handling capacity. In addition, although Hieronymus (p.179) notes that elevator managers often attempt to increase returns to [illegible] through storage hedges, wheat merchandisers contend that returns to storage hedges have declined.

Evidence supports this contention. Research results reported in this paper indicate that returns to routine storage hedges averaged 11 cents/bu. less after 1982 than before. Representatives of the wheat industry have suggested that the reason for this decrease in return to storage hedges is the increased proportion of grain stocks that is controlled by government. This hypothesis has important applications both for merchandisers making marketing decisions and for policy makers. If true, it suggests that the source of an elevator's storage revenues will come primarily from government storage programs when government-controlled stocks are large, and primarily from storage hedges and farmer stored wheat when government-controlled stocks are small.

Oklahoma wheat merchandisers commonly hedge wheat at harvest if the price spread between the July and December KCBT wheat contracts offers at least 70% of carry. Research results support this simple decision rule. Some merchandisers also use the probability of basis gains as a second indicator of potential storage hedge gains. Research results suggest that use of this rule would have increased net returns to storage hedges slightly.

The objectives of this paper are to: (1) verify wheat merchandisers' and elevator managers' contentions that returns to storage hedges were lower after 1982 than before 1982; (2) identify simple strategies that wheat merchandisers could have used to increase returns to storage hedges; and (3) test the hypothesis that reduced returns to storage hedges after 1982 were primarily due to government storage programs.

Procedures

The analysis is conducted for an elevator in central Oklahoma whose primary cash market for hard red winter wheat is the Texas Gulf, and which hedges on the Kansas City Board of Trade (KCBT). Five marketing strategies are evaluated to determine if returns to storage hedges have been significantly lower after 1982 than before 1982, and to evaluate a simple alternative decision rule which more completely uses information available to merchandisers.

The calculated returns to storage hedges are used to evaluate the hypothesis that increased government control of grain stocks has reduced returns to storage hedges. As the proportion of controlled stocks increases, holding export commitments constant, basis is expected to increase (Tilley and Campbell). Thus, if a large proportion of stocks are government-controlled, basis at harvest would be higher than otherwise, the potential basis gain would be less, and the returns to storage hedges less.

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Formally, the elevator's net return to storage hedging is

(1) $NR = XC^1 + (1-X)\,C^2 + (1-X)\,(F^1 - F^2) - (1-X)\,CC - C^1$

where:

NR = Net return (cents/bushel).
C^n = Sales price of grain, Gulf bid minus transportation costs in period n, n = 1,2.
F^n = Futures price of December contract in period n, n = 1,2
C^1 = Purchase price of grain, Gulf bid minus freight from central Oklahoma on June 20th.
CC = Carry costs (number of days wheat is stored multiplied by the sum of daily storage and interest costs).
X = 1 if sell at harvest[1]
X = 0 if store wheat at harvest

Five types of marketing strategies are evaluated here:

(1) Wheat is routinely stored at harvest (the first trading day on or after June 20) and sold at the Gulf on the last trading day of November (period 2); (X = 0).
(2) Hedges are routinely placed at harvest on the December KCBT wheat contract and wheat is stored until the last trading day in November (period 2), at which time the hedge is offset and the wheat is sold at the Gulf; (X = 0)
(3) The merchandiser hedges as in (2) if the July-December spread at harvest is at least 70% of the cost of carry from harvest through the last trading day in November (X = 0), and otherwise sells the wheat immediately at the Gulf (X = 1).
(4) The merchandiser hedges as in (2), storing wheat and selling futures in period 1, and liquidating futures and selling wheat in period 2 (X = 0) if the July-December spread plus the expected gain in basis from the July contract to the December contract is at least 100% of the cost of carry from harvest through the last trading day in November, and otherwise sells the wheat immediately at the Gulf (X = 1).
(5) The merchandiser hedges routinely as in (2), storing wheat and selling futures in period 1, and liquidating futures and selling wheat in period 2 (X = 0), but with perfect information lifts the hedge and sells the wheat on the day on or before the last trading day in November that earns the highest return, where period 2 is defined so that net return (NR) is maximum.

Reportedly, hedging decisions are often based on rules-of-thumb such as "Hedge if market is offering x% of carry", taking the form of strategy (3) above. In central Oklahoma, for example, a merchandiser would hedge at harvest (approximately June 20) and store for sale in late November if the spread between the July and December Kansas City Board of Trade (KCBT) futures contracts is at least 70% of the cost of carry from harvest through November. If the spread is offering 60-65% of carry, some merchandisers will examine additional information such as historical basis before making a hedging decision.

The implicit assumption with this decision rule is that if the July to December spread offers 70% of carry, the expected basis gain from the July contract at harvest to the December contract on the last trading day in November will make up the remaining 30% of carry or more.

A more precise decision rule (strategy (4) above) is proposed here in which the expected basis gain from the July to the December contract is explicitly, rather than implicitly, considered. At harvest time, the expected return from hedging is the July to December spread plus the expected basis gain. If this is greater than the cost of carry, a storage hedge is expected to be profitable. In other words, if cost of carry is less than the July-December spread plus the expected December contract basis on the last trading day of November minus the current July contract basis, the merchandiser should place a hedge.

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[1]Note that if wheat is sold at harvest, net return to storage hedging = 0.

strategies, basis is calculated as Gulf bid minus freight from central Oklahoma to Gulf KCBT December futures. Expected December contract basis is the average of previous contract bases evaluated on the last trading day of November, except that the expected basis is the actual basis that resulted for that year.

Freight costs are rail rates paid by an elevator in central Oklahoma for shipment of wheat to Gulf interest rates are those paid by the same elevator for borrowed money from Bank for (Wichita, Kansas), and storage costs are the elevator's variable costs of maintaining wheat Prices used are daily Kansas City Board of Trade July and December wheat futures and daily Gulf bids from 1974 through 1991.

In order to evaluate the hypothesis that reduced returns to storage hedges after 1982 are due to control of higher proportions of grain stocks, two regressions are estimated. The first the relationship between net returns to a routine hedge (strategy (3) above) and the July- spread at harvest-time. A pre-1982/post-1982 dummy variable is included to capture any in returns to storage hedges from 1982 on. The significance level of the coefficient of the variable will provide a test of the hypothesis that returns to routine storage hedges were significantly lower from 1982 on.

A second regression adds a variable measuring proportion of wheat stocks restricted by government programs. The variable is defined as Commodity Credit Corporation (CCC) stocks plus Owned Reserve (FOR) stocks, divided by total wheat stocks. Each of these is measured on approximately 20 days before harvest is complete. The coefficient of this variable measures the extent to which returns to storage hedges are effected by government control of wheat stocks. Comparing the two regressions will help assess the extent to which proportion of stocks in CCC and FOR account for reduced returns to routine storage hedges from 1982 on.

Results

Table 1 presents net returns to the above marketing strategies. The results suggest that, for all strategies, net returns were lower from 1982 through 1991 than from 1974 through 1981. Before 1982, a routine hedge averaged $0.08/bu, two cents less than using the July-December spread and three cents less than using the expected basis indicator (spread plus expected basis gain) to selectively hedge. From 1982 through 1991, however, net returns to these same strategies were substantially lower. Returns to a routine hedge declined by 15 cents/bu to -$0.07/bu (Figure 1), and returns to the selective hedges (strategies (3) and (4)) declined by 10 cents/bu. Even with perfect information (strategy (5)), average net returns declined from $0.15/bu pre-1982 to $0.08/bu post-1982.

Of the selective hedging strategies, the spread indicator (strategy (3)) performed worse after 1982 than before, averaging $0.10/bu before and $0.00 after (Figure 2), while the expected basis indicator performed slightly better (Figure 3). The July-December spread offered 70% of carry six out of eight years before 1982; hedging would have earned positive net returns five of those six years. After 1982, the spread indicator offered 70% of carry only three out of ten years, earning a positive return only one of those years. It gave two hedge signals which resulted in negative returns, and one no-hedge signal (in 1988) which would have yielded a positive return (see Table 1). The expected basis indicator (strategy (4)) performed slightly better than the spread indicator both before and after 1982, with returns averaging $0.11/bu before and $0.01/bu after 1982. It offered 100% of carry four out of six years before 1982, earning positive net returns all of those four years but missing one chance (in 1979) for a gain of $0.10/bu.

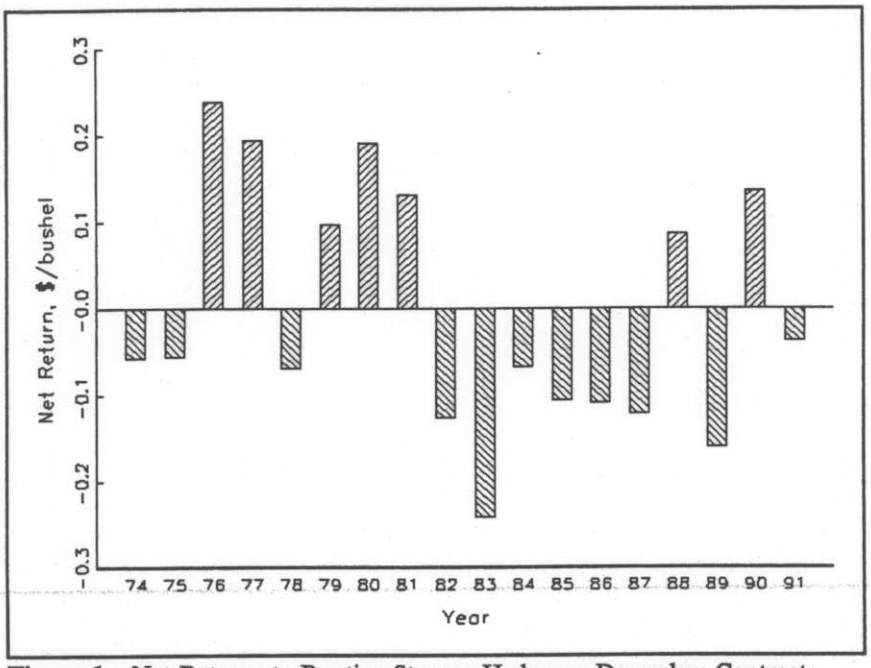

Figure 1. Net Returns to Routine Storage Hedge on December Contract, 1974-1991

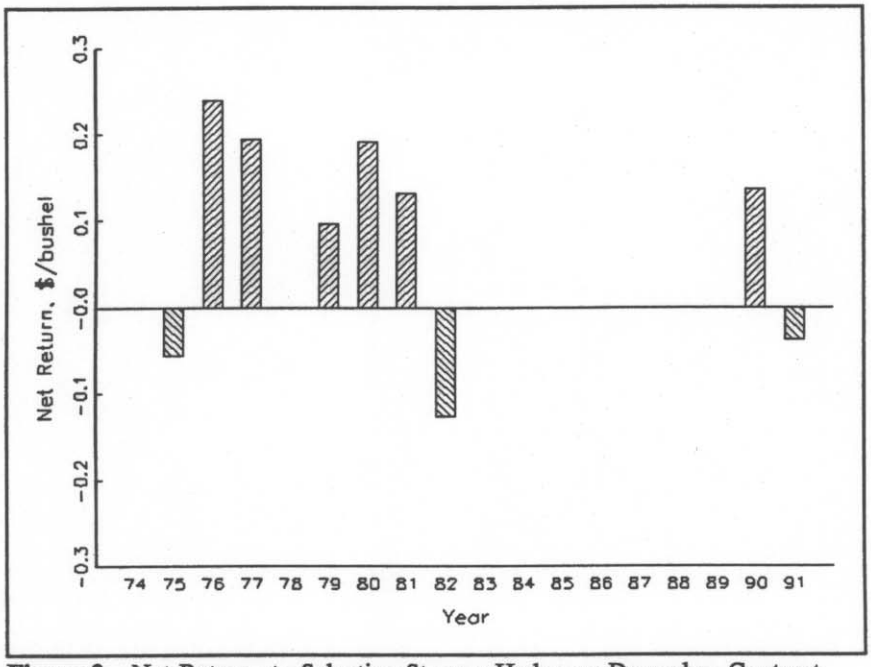

Figure 2. Net Returns to Selective Storage Hedge on December Contract, 1974-1991; Using 70% Carry Trigger

After 1982, the expected basis indicator offered carry two out of ten years, earning a positive return in both of those years. In every instance where a positive net return to hedging was available the expected basis indicator gave a hedge signal, and in each year where a negative return would have resulted, the indicator gave a no-hedge signal. In essence, the expected basis indicator gave the same results as shown for the spread indicator in Figure 2, except that it eliminated three negative returns (1975, 1982, and 1991) and a positive return in 1979.

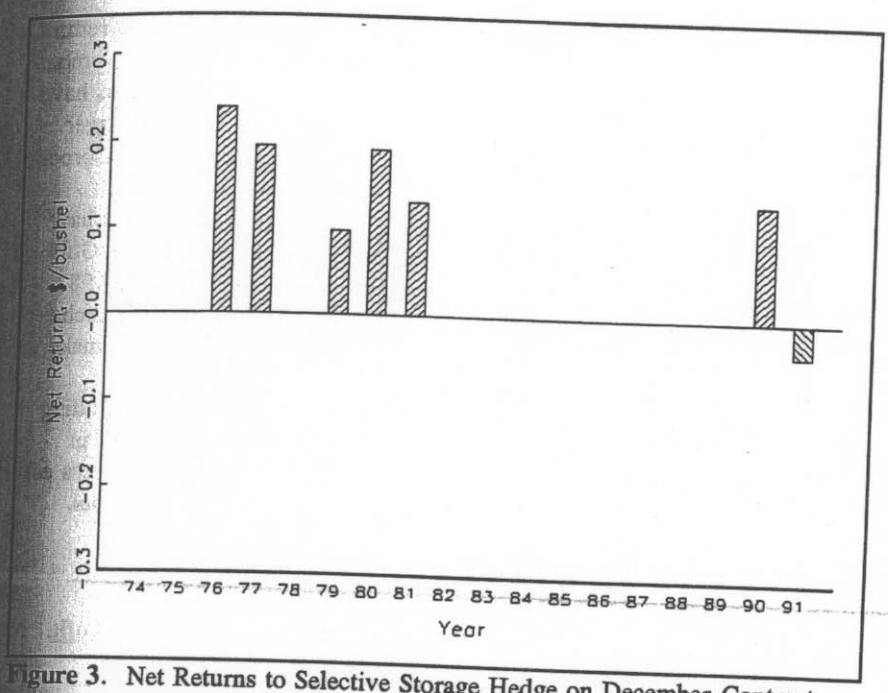

Figure 3. Net Returns to Selective Storage Hedge on December Contract, 1974-1991; Using Expected Basis Trigger

A notable result is the small number of years (two, 1988 and 1990) from 1982 through 1991 in which a net positive return to a harvest-through-November storage hedge was available (Figure 1). Tables 2 and 3 present the results of regressions designed to test the hypothesis offered by wheat industry representatives that the large amount of government-controlled stocks in years following 1982 has limited market returns to storage.

Table 2 indicates that the coefficient of the July-December spread is significant at the 2% significance level and explains a large portion of net returns to a routine hedge. The coefficient of the dummy variable is significant at the 6% significance level, and indicates that average net returns to a routine hedge were $0.11/bu lower from 1982-1991 than from 1974-1981, after accounting for variation in the July-December spread.

Table 3 indicates that including the stocks variable increases the explanatory power of the spread variable, so that the coefficients of both the spread and the stocks variables are significant at the 1% level. However, the coefficient of the pre-1982/post-1982 dummy variable becomes insignificant. These results suggest that the increase in proportion of government-controlled stocks is responsible for most of the reduction in returns to storage hedges from 1982 through 1991. This also suggests that knowledge of proportion of government-controlled stocks could be effectively used by merchandisers in planning marketing strategies.

Summary and Implications

Oklahoma wheat merchandisers contend that returns to storage hedges for hard red winter wheat have been lower and less frequent since 1982 than before 1982. The evidence cited here supports that contention. The reduction in returns ranged from a minimum of 7 cents/bu. (if the merchandiser had perfect information) to 15 cents/bu. (if the merchandiser had routinely hedged).

A storage hedging decision rule commonly used by merchandisers in central Oklahoma is to hedge at harvest if the spread between the July and December KCBT wheat contracts offers at least 20¢ of carry. A more precise decision rule occasionally used is expected basis gain from the July contract to the December contract in addition to the July-December spread as an indicator. Although relatively easy to use, it performed somewhat better than the above decision rule both before and after 1982. However, hedging returns to both decision rules declined by 10 cents/bu. from before

1982 to after 1982. Research to better predict basis might allow merchandisers to increase returns by lifting hedges closer to the optimal time rather than holding until the last trading day in November.

Regression estimates provide additional evidence that market returns to storage hedges have declined substantially after 1982, and suggest that the major reason for this decline is the larger proportion of wheat stocks controlled by government programs such as Commodity Credit Corporation storage and the Farmer Owned Reserve over this time period.

These results have two major implications. First, since government-controlled stocks have declined recently, merchandisers in central Oklahoma and perhaps others shipping to Texas Gulf destinations may find returns to storage hedges more attractive now than in the years since 1982. The better predictions from the expected basis indicator than the spread indicator suggest that merchandisers should consider expected basis gain as well as the spread between futures contracts as they make their hedging decisions.

Second, some policy proposals call for raising loan rates for major commodities, including wheat, in the near future. A likely result would be an increased proportion of wheat stocks in government-controlled storage. In such an event, merchandisers are likely to have less success earning market returns to storage hedges, but may be able to earn more government storage payments.

References

Hieronymus, Thomas A. Economics of Futures Trading: For Commercial and Personal Profit. New York: Commodity Research Bureau, Inc., 1977.

Tilley, Daniel S., and Steven K. Campbell. "Performance of the Weekly Gulf-Kansas City Hard-Red Winter Wheat Basis," American Journal of Agricultural Economics, November 1988, 70(4):929-35.

Table 1. Net Returns to Wheat Pricing Strategies for Elevator in Central Oklahoma

Year	Store with no Hedge	Routine Hedge	Perfect Info. Hedge	Spread 70% of Carry Hedge	Exp. Basis Gain 100% of Carry Hedge
1974	0.27	-0.06	0.02	0.00	0.00
1975	0.06	-0.05	0.02	-0.05	0.00
1976	-1.17	0.24	0.27	0.24	0.24
1977	0.36	0.19	0.21	0.19	0.19
1978	0.13	-0.07	0.09	0.00	0.00
1979	-0.00	0.10	0.23	0.10	0.00
1980	0.69	0.19	0.20	0.19	0.19
1981	-0.01	0.13	0.18	0.13	0.13
1982	-0.17	-0.13	0.14	-0.13	0.00
1983	-0.21	-0.24	0.00	0.00	0.00
1984	-0.23	-0.07	0.19	0.00	0.00
1985	-0.22	-0.11	0.08	0.00	0.00
1986	-0.01	-0.11	0.03	0.00	0.00
1987	0.19	-0.12	0.00	0.00	0.00
1988	-0.02	0.09	0.09	0.00	0.09
1989	-0.30	-0.16	0.08	0.00	0.00
1990	-0.77	0.14	0.14	0.14	0.14
1991	0.68	-0.04	0.06	-0.04	0.00
mean	-0.04	-0.00	0.11	0.04	0.05
sd	(0.45)	(0.14)	(0.09)	(0.10)	(0.09)
pre-1982 mean	0.04	0.08	0.15	0.10	0.11
pre-1982 sd	(0.54)	(0.13)	(0.10)	(0.11)	(0.10)
post-1982 mean	-0.11	-0.07	0.08	0.00	0.01
post-1982 sd	(0.37)	(0.11)	(0.06)	(0.06)	(0.05)

Table 2. OLS Estimation of Returns to Storage Hedges

Independent Variable	Coefficient	Standard Error	T-Ratio (15 df)	p-value
July - December spread	0.921	0.364	2.53	0.02
Pre-1982/Post-1982 dummy	-0.108	0.053	-2.05	0.06
Constant	-0.097	0.078	-1.25	----

Adj. $R^2 = 0.45$ DW = 1.9

Dependent Variable: Net Return to Routine Hedge on December contract, 1974-1991

Table 3. OLS Estimation of Returns to Storage Hedges

Independent Variable	Coefficient	Standard Error	T-Ratio (15 df)	p-value
July - December spread	1.096	0.343	3.19	0.01
Pre-1982/Post-1982 dummy	-0.017	0.066	-0.25	0.81
(CCC + FOR)/Ending Stocks	-0.238	0.119	-2.00	0.01
Constant	-0.066	0.073	-0.90	----

Adj. $R^2 = 0.54$ DW = 2.1

Dependent Variable: Net Return to Routine Hedge on December contract, 1974-1991