Module 8

Basis, Localizing 1997 Grain Prices, and Returns to Storage

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Topics

Introduction

In **Module 6**, we defined basis and explored the risks that were associated with this concept. Woven within the discussion was the argument that each producer must maintain his/her basis database. As a finale to this topic, we explain how to use the respective Ohio State and Iowa State Universities' basis programs to garner and analyze basis data and risks. As an example, the data are used to localize futures prices to estimate harvest prices for 1997. Then futures price spreads and expected or anticipated basis data are used to make storage decisions. Outcomes for both short and normal crop years are presented. We end with a second example analyzing the prospects for storing grain in 1997/98. The process may by used for analyzing data for any year.

Localizing Futures Prices *(or go to* ***Topics*** *)*

Futures prices are price bids and offers for future acceptance or delivery of a commodity in Chicago. Since producers do not exchange commodities in Chicago, futures prices and their distributions must be modified to reflect local supply and demand conditions in the market where trading occurs. Futures prices are localized by subtracting the nearby basis from the nearby futures price. The formula is: Cash Price = Nearby Futures Price - or (+) Expected Nearby Basis - Marketing Costs (brokerage fee, interest on the margin, etc.). If the producer hedges or hedges-to-arrive to price grain, this formula provides an estimate of the cash price or localized price that will be received. For the traditional hedge contract, the final outcome depends on the difference between the expected basis and the existing basis at the time of delivery. Since the basis can be locked in prior to or at delivery for a hedge-to-arrive contract, the cash price may be determined for this contract prior to delivery. The estimated cash price for either contract offsets anticipated production costs, cash flow obligations, and living expenses, the important financial topics discussed in module three.

When a producer markets grain via options contracts, the formula must be modified to include the respective premium on the put or call. Therefore Cash Price = Nearby Futures Price - (+) nearby basis - Put (Call) Premiums - Marketing Costs. In the following paragraphs, these formulas are used to localize 1997 corn prices for central Ohio and central Iowa grain producers. (If you do not have access to local basis data, contact your county or state extension specialists). The effects of the nearby basis and different marketing strategies on net incomes will be examined. Assuming that you have historic basis data for your local markets, these examples could be replicated for both soybeans and wheat.

Assume that a producer planted 500 acres of corn in 1997. If corn yields average 120 bushels/acre, this farmer will produce 60,000 bushels of corn. Assume that the December 1997 future is trading at $2.70. Based on the 1986-to-1994-futures price database, corn prices historically were above $2.70/bu at harvest about 8% of the time. Based on current futures prices and options premiums as reported in **Module 5**, the probabilities that prices will be above $2.70 at harvest time was more than 50%.

Table 1 shows tha in central Ohio and central Iowa, the respective nearby harvest basis averaged 22 cents and 30 cents under the nearby futures price. The standard deviations about the means for central Ohio and central Iowa were 5 cents and 9 cents, respectively. The results for these assumptions and data are reported in the following table. Premiums for puts and calls are based on at-the-money bids.

If a central Ohio producer hedges, the expected localized cash price is $2.46/bushel. Based on the five-cent standard deviation, there is 68% probability that the expected localized price will range from $2.41 to $2.51. Although not shown in the table, the hedge-to-arrive contract will generate similar results. If the local elevator does not require margin payments, marketing costs may be reduced relative to the cost associated with the hedge. Based on futures prices and options premiums as reported in module five, there is about a 50% probability that prices may increase or decrease. Whether one would take that risk by remaining unpriced depends on one's financial status. Remember, that Mr. and Mrs. Owner could take much more risk than could Mr. and Mrs. Buyer in **Module 3**.

Hedging and buying a call or buying a put reduces the expected minimum price by the amount of the respective premiums and the marketing costs relative to the returns for the traditional hedge. The expected localized price for a short hedge and buying a call is $2.27/bu for Iowa. An Iowa farmer may establish a $2.29 minimum price by buying a put. The advantage of both strategies is that the producer can capture any price improvement that may occur and yet minimize downside price risk. A producer should pay the premium provided the expected net return at least equals the cost of the premium, financial considerations requires avoiding risk, and he/she judges that there is substantial probability of higher prices. Remember that there is at least a 50% change that futures prices will increase by harvest. A major advantage of the (hedge and buying call) strategy is that an out-of-money call can be purchased at a much lower cost. For example, a $2.90 call may be purchased for $0.03/bu.. Thus, the expected localized price equals $2.34. Of course, futures prices must increase above $2.93 ($2.90 + $0.03) before the producer benefits from the increase in the futures price. This means that the producer must be willing to give up the potential $0.13 ($2.93 - $2.80) upward price move.

All outcomes for central Iowa and central Ohio are the same except the weaker expected basis in Iowa reduces the variance in the expected localized price and gross income. Further, the larger standard deviation in Iowa increases the possible range in localized prices and gross incomes. The differences in bases and gross incomes between the two locations illustrates why producers must collect and monitor their respective basis. These differences in basis at different locations are also observed within the two respective states. For example, the basis for a county market in northwest Ohio is $0.10 to $0.15 weaker than is the Ohio River (barge) basis. Corn growers near Mississippi River markets in eastern Iowa typically have a 20 to 22 cent stronger basis than in central Iowa. Producers who have identical production costs, cash flow requirements, and living expenses, must monitor the basis to determine the localized price and thus the expected gross income that can be used to offset production costs, cash-flow obligations, and living expenses.

Differences in yields, production costs, and other obligations may negate the impact of the weaker basis. For example, the 1992 and 1994 average corn yields in Iowa were 9 bu greater than the corresponding two-year average for Ohio. Based upon the respective 500 acres of corn plantings, localized prices, and average corn yields, the expected 1997 gross income for an Ohio producer who hedges is $173,260. In contrast the Iowa producer expects to receive $178,560 of gross income. The important point is that the price received or offered at harvest time, or the fall-delivered hedge price if the crop is hedged, should be used to estimate gross incomes to offset production costs. The received or accepted price is either locked in prior to harvest or accepted at the time grain is sold at harvest time. The offered price is the local market price of grain at the time unpriced grain is put into storage. Thus, if the local market is offering a futures price of $2.70 for corn at the time the producer elects to store the grain, the $2.70 should be used to offset production costs. Any increases in futures prices for the remainder of this crop year represent either carry-in for the market or speculation. The carry-in for the market and potential basis improvement is used to offset storage costs. The next section examines these issues and attempts to answer the question, "Should corn and/or soybeans be stored."

Basis Improvements, Storage Costs, and Returns to Storage *(or go to **Topics**)*

Seasonality is an important part of grain cash and futures markets. Regular seasonal price patterns are caused by several factors. From harvest into early spring, old-crop supplies are known and one of the market's main tasks in a normal crop year is to seek an equilibrium that will encourage just enough grain to be sold from storage to meet current demand. In a short-crop year such as 1995/96, its main job is different: namely to find a price that will adequately but not excessively ration limited supplies, and allow at least a minimal carryover at the end of the marketing year. In normal crop years, gradually increasing cash prices are necessary after harvest to cover storage costs. This can come through basis improvement or higher futures prices, or both. Like all other markets, there is always some risk that storage costs will not be covered by improving prices. This is particularly true for short crop years where irregularly downtrending prices are the typical patterns, and unpriced storage is much more risky than usual.

Table 2 presents historic data for both short and normal crop years. From it, we can examine the impact that changes in futures and cash prices have on basis improvement, and examine the outcomes for storing unpriced and priced (hedged) grain. Local basis improves when the basis is getting stronger or the relative increase (decrease) in the cash price is greater (less) than the corresponding changes in the futures price.

1. Basis Improvement for Selected Normal Crop Years *(or go to* ***Topics*** *)*

As displayed in the above table and in **Figure 1**, the nearby basis improves for the normal crop years for both central Iowa and Ohio. For 1986/87, the nearby basis improvements for the two locations are very similar. The central Ohio basis for 1994/95 improved more than for 1986/87. This occurs because there is more carry-in the futures market or the spreads are larger relative to 1986/87 and the nearby harvest basis was weaker in 1994/95 than in 1986/87.

If a central Ohio producer placed a hedge in 1986/87 to store grain, the gross returns to storage (basis improvement plus spreads) minus marketing costs is 19 cents, 24, 29, and 31 cents, respectively, to store corn to January, March, May and July. In **Table 3**, these outcomes occurred whether futures and cash prices increase or decrease. When grain is stored and hedged, futures price risks are removed. However, basis risk does remain, but it is much less than price risk, and basis can be locked in later to eliminate basis risk.

To store and hedge grain to January, for example, the producer sells a March futures contract at harvest time. The corn is stored or is effectively bought at $1.52. At harvest time the spread between the futures and cash market is $0.27. In January, the March futures contract is bought back at $1.57 for a profit of $0.22. Simultaneously, the corn is removed from storage and is sold for $1.48 in the local market. Since the cash price declined, a $0.04 loss is taken in the cash marker. In both markets, prices have fallen; however, the spread between the futures and cash price has declined to $0.09 by January.

Thus, the basis has improved by $0.18 between harvest and January. The basis improvement plus the December-March spread which was locked in when March futures were sold is the gross returns to storage. As you work through the March and May storage examples, notice when hedged, changes in futures or cash prices do not affect the outcomes, except as these changes affect basis or the potential improvements in basis. Further, recognize that once the basis improvement is estimated, one does not need to work through the traditional "T" table exercise to determine the outcome. Except for potential basis risk, the outcome is known once the basis improvement is estimated. Finally, the storage period is selected by determining the highest expected net returns from storage. That is, the highest potential net return is determined by subtracting the respective storage costs from the gross returns to storage or from the basis improvement estimates. A producer should store if and only if the expected net returns are positive, so that a storage profit is available. In some cases where storage involves shifting income from one year to the next, the net return to be considered would be a net after-tax return.

2. Storage Costs *(or go to* ***Topics*** *)*

Storage costs are made up of three components: fixed costs, variable costs, and foregone interest charges. Fixed storage costs are expenses that must be paid even if the producer does not store grain. Fixed storage costs include depreciation, interest charge for the use of funds to acquire equipment, annual repairs and maintenance, real estate taxes, and insurance for buildings and equipment. If a producer is anticipating building storage facilities, fixed storage costs should be carefully estimated. A producer would not build the facilities unless the expected basis improvement offset all fixed and variable costs including interest charges. Once the storage facilities are in place, fixed costs should not be a part of the decision of whether to store in any specific year.

Variable storage costs are expenses that must be paid to store grain but equal zero ($0.00) when grain is not stored. Variable storage costs include labor and management, insurance of grain or risk equivalent, grade loss, rodent and insect control, excess drying loss, and loss of grain. As a rule of thumb, variable storage costs will equal $0.02 to $0.03/bu/month to store grain on the farm. In the following examples, we will assume that variable costs equal $0.025 per bushel per month. You must estimate your specific variable storage costs for your farm.

Foregone interest charges or the opportunity cost of money is a very important storage cost. It, too, is a variable cost and equals zero when grain is not stored. If a farmer can sell corn at harvest time for $3.00/bu and can get a return of 10% on this money or pay off loans and save an equivalent amount, the monthly interest charge is $3.00 (X) 10% = $0.30 annually or $0.30/12 months = $0.025/month. When soybeans sell for $6.00/bu at harvest time, the monthly interest charge equals $0.05. Ten percent may seem like a high return, but using this money to repay outstanding loans which may carry interest rates ranging from 8% to 20% (credit cards) suggests that for many producers the 10% rate may be a good rule of thumb. To complete this analysis for your farm, compute the foregone interest charge based upon your known expected rate of return.

To continue the corn example for 1986, the foregone monthly interest charge is $1.52 (average harvest price) times 10% /12 or 1.3 cents/bu. Adding the average 2.5 cents variable storage costs to the monthly interest charge results in some monthly storage costs equaling 3.8 cents. Total variable costs to store from harvest to January, March, May, and July would be $0.114, $0.19, $0.266, and $0.342 respectively. Assuming that the facilities are in place, fixed costs are ignored. The expected net return for storing grain in central Ohio would have been:

Months	**January**	**March**	**May**	**July**
Gross Returns to Storage ($/bu)	**$0.19**	**$0.24**	**$0.29**	**$0.31**
Total Variable Costs ($/bu)	**$0.114**	**$0.19**	**$0.266**	**$0.342**
Net Returns to Storage ($/bu)	**$0.076**	**$0.05**	**$0.024**	**-$0.032**

Based on the above assumptions, the best storage decision is to store grain to January based on the March futures price. This decision resulted in a 7.6 cents net return to storage minus marketing costs which equal one to two cents/bushel. Before removing the corn from storage for sale in January, the producer should have re-evaluated the spreads and expected basis. If net storage returns could be increased, the hedge would be rolled forward into another deferred futures month. Since the net return to storage approaches zero if the hedge is extended to later contracts, it is assumed that the corn was sold in January. As always, the producer could use a put or a call option to establish minimum prices. However, net storage costs are reduced by the amount of the premium and should be used if and only if the expected gain in futures prices will at least offset the cost of the options and a significant probability of higher prices exists. Probability analysis should be used to help make the decision to hedge or use options.

3. Storing Unpriced Grain for Selected Normal Crop Years *(or go to* ***Topics*** *)*

Another alternative is to store grain that is unpriced. This marketing strategy exposes the producer to both price and basis risks. As long as a hedge or options strategy results in positive net storage returns, the prudent producer should avoid the price risk. If your probability estimates indicate that futures prices will be increasing, separate the storage strategy from the speculation function by buying a call or by taking a long position in the futures market. Since profits from speculation are not a return to storage, our advice is to store and hedge (use options) grain when the expected improvement in basis is greater than variable storage costs and interest charges. If net returns to storing and hedging grain is negative, this is a signal that the market wants your grain now. Therefore, do not store grain for more than a very short time. If you want to speculate, do so by buying a call or by taking a long position in the futures market. Risks by retaining ownership through options purchases are limited to the initial premium paid plus the brokerage costs. Risk-exposure by retaining ownership of the physical grain includes (1) the risk of declining prices and weakening basis, (2) storage and interest costs, and (3) quality deterioration if the grain is stored on the farm.

For those who traditionally store unpriced grain, please consider the following rule for making your speculative decision. Speculate on stored grain if and only if the basis improvement minus variable storage cost and interest charge is less than the premium of a call. If the premium for the call is less than the basis improvement minus combined storage costs, sell the grain and speculate by buying the call.

To finish this example, let's examine the outcomes for storing unpriced grain for the 1986/87 and 1994/95 crop years. The following table displays the net returns for 1986/87:

Months	**January**	**March**	**May**	**July**
Change in Cash Price between Harvest and Selected Months	**-$0.04**	**-$0.02**	**$0.33**	**$0.16**
Total Variable Costs	**$0.114**	**$0.19**	**$0.266**	**$0.342**
Net Returns to Storage	**-$0.154**	**-$0.17**	**$0.064**	**-$0.182**

Given perfect information, the Ohio producer would have earned 6.4 cents by storing the grain to May. Any other decision would have resulted in a loss. Even with a $0.02 cent marketing cost (brokerage fees and interest charges) hedging grain to January returned 5.6 cents/bu. Except for basis risk, the latter are a known outcome, while the unpriced strategy is highly risky. Further, the longer the storage period, the greater the risk that grain will go out of condition. This adds to the above stated storage costs.

For 1994/95, storing and hedging grain in central Ohio to January 1995 results in a net return of $0.12/bu. Because 1995 became a short crop year, holding unpriced grain to July 1995 results in net storage returns of $0.48/bu. Speculation under these conditions pays off. The producer who hedged and sold grain in March and speculated by buying a call at harvest time would have gained more than the person who speculated on unpriced grain. Similar conclusions also appear for the central Iowa data (**Table 2**).

Figures 2 and **3** show average as well as extreme high and low net returns for unhedged storage of corn and soybeans in northwest Iowa for the 1979-80 through 1996-97 marketing years. Expenses deducted to compute net returns included drying and shrink for two extra points of moisture removal for safe storage (for corn only), interest, handling, and a one percent quality deterioration after six months of storage beyond harvest. Average net corn storage returns were negative when government program incentives are excluded. However, in about one year out of three, unhedged storage profits into summer were positive. In some years, generally after a short crop, storage into the next summer generated large losses. For soybeans, average unhedged storage returns were positive, but the returns varied widely from year to year. These charts indicate routine unhedged storage is a speculative activity that can actually increase risk exposure when compared with other marketing alternatives.

4. Basis Improvement and Storing Unpriced Grain-Selected Short Crop Years

*(or go to **Topics**)*

In **Table 2**, 1988/89 data are presented for central Ohio and 1988/89 and 1993/94 data are presented for central Iowa. For this analysis, we focus on the central Iowa data. For short crop years, basis improvement is relative small compared to normal crop years (**Table 2** and Figures **1** and **4**). There is little carry in the futures market, local basis improves only modestly, and both futures and cash prices tend to fall as the storage year progresses. The market is sending the signal to sell the grain now. Foregone interest charges are higher than in normal crop years, because cash prices are relatively high at harvest time. In 1988 and 1993, harvest prices averaged $2.44 and $2.36 respectively in central Iowa. Thus, the monthly foregone interest charge for both years approached $0.02/bu. Added to the $0.025 variable storage costs, total monthly variable costs and interest charges equals $0.045/month. For both short crop years, storing and hedging grain results in negative net returns to storage. Storing unpriced grain in 1988/89 would also have resulted in losses for January, March, May, and July (**Table 2**). In 1993, storing unpriced grain to January would have returned $0.245 cents/bu. Thereafter, the producer would have broken even in March and would have sustained losses by storing until May or July 1994.

5. 1997/98 Corn Storage, Basis Improvement, and Price Patterns, an example

*(or go to **Topics**)*

The futures appears to want the corn at harvest time. There is only $0.09 carry in the market between the December 1997 and March 1998 contracts, 13 cents to May, and $0.16 between December and July. The futures price in September is inverted relative to July. Based on either Ohio or Iowa data, storing and hedging corn may not be profitable. This will be particularly true if futures corn prices increase causing the opportunity cost (interest costs) to increase. Storing unpriced corn is very risky. Unless your current harvest basis is significantly weaker than normal, it is our recommendation that you do not store corn for a long period of time. If you choose to speculate, take a long position in the market or buy a July or September call. At the money calls are trading for $0.19. These premium costs are well below the corresponding variable storage costs and interest charges to store grain to July.

6. 1997/98 Soybean Storage, Basis Improvement, and Price Pattern, an example
(or go to ***Topics*** *)*

Because of the expected large soybean crop, spreads are wider for soybeans than they are for corn. That is, there is nine cent spread between November 1997 and March 1998, 15 cent spread between November and May, and a 21 cent between November and July. In the Ohio Central market, the current nearby harvest basis is 25 cents under, seven cents weaker than for the 1994/95. Based on these numbers, basis could improve by 24 cents to March, 30 cents to May, and 36 cents to July. Since variable storage costs including interest are estimated at $0.05/bu/month, total storage cost to March, May and July may equal 20 cents, 30 cents, and 40 cents, respectively. Storing and hedging soybeans to March may cover variable storage costs and interest rates for central Ohio. Thereafter, net storage returns are zero (0) or negative for hedging and storing into the deferred months. For those who want to accept the price risk, compare the storage costs and interest charges to a call premium.

Basis Programs *(or go to* ***Topics*** *)*

As indicated, both Iowa State University and Ohio State University maintain basis programs and databases. At ISU, Dr. Robert Wisner maintains a spreadsheet containing weekly data that date back into the 1970s. For those who have experience with spreadsheets, this is an excellent program. You can either acquire the spreadsheet and enter your own data or have your data entered at ISU.

The program at OSU is a compiled dBASE program. It has a database dating back to 1980. This program is used to enter data and to create files that can be read by spreadsheet programs. The OSU program is less flexible than the ISU program but requires less computer knowledge to operate it. Documentation has been published to support this effort. If you want to have access to either program, contact us using the **1-800-678-6269.**

End of Module *(or go to* ***Topics*** *)*

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