



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Pre-Harvest Risk Management for Kentucky Grain Farms

Todd Davis
University of Kentucky
Agricultural Economics
todd.davis@g.uky.edu
270-365-7541 ext. 243

Eric Schwenke
University of Kentucky
Agricultural Economics

***Selected Paper prepared for presentation at the Southern Agricultural Economics Association's 2018
Annual Meeting, Jacksonville, Florida, February, 2-6 2018***

Copyright 2018 by Davis. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Pre-Harvest Risk Management for Kentucky Grain Farms

As grain farmers manage their business in a period of tight or negative profit margins, traditional risk management tools should be considered to manage price risk for bushels to be sold at harvest. Managers that started farming in the 2007-2014 boom period may have not fully understood the benefit of using pre-harvest price risk management tools. The 2007-14 period benefited from cash and futures prices trading at profitable levels. A return to more typical profitability levels motivates the analysis of how pre-harvest risk management has performed historically and implications for protecting price in the current grain market fundamentals.

This paper analyzes the effectiveness of hedging corn, soybeans, and wheat before harvest in the months where the futures contract has the largest probability of trading in the top third of the price range. For corn, pre-harvest hedging in February and May will be evaluated assuming a harvest sale in October. For soybeans, pre-harvest hedging in February, May, and July will be evaluated assuming an October sales. Pre-harvest hedging in July and October before the June harvest date will be evaluated for winter wheat.

Data and Methods

Daily closing futures prices for the December corn, November soybeans, and July wheat futures contract for the 2000 to 2017 crop years are used to evaluate the months where prices tend to trade in the top third of each year's price range (CRB). Hedging at the top of the market is a goal many farmers have but is an outcome challenging to achieve. Identifying the months that are more likely to achieve the top third of the market is an alternative goal for managers planning to

sell at harvest due to lack of storage or for cash flow. The top-third price may not be at a level that covers all budgeted costs; however, the hedged price is more likely to be larger than selling at harvest without any price protection.

Figure 1 shows the historical seasonal pattern in the December corn futures contract for the 2000 to 2017 crop years. The red colored bars in Figure 1 indicates when the futures contract has typically traded at each year's bottom-third price. It is not surprising that the likelihood of obtaining a price in the bottom-third is 53, 61, 61, and 48 percent, respectively, in August, September, October, and November over the eighteen-year period (Figure 1). Given the different production and demand conditions in any given year, the futures market top-third has occurred during harvest; however, the likelihood of the futures price trading in the top-third of the market at harvest averaged about 20% (Figure 1).

Figure 1 reminds farmers that better hedging opportunities often occur while the seed is still in the bag and the planter is in the machine shed. On average, the December corn futures contract has traded in the top-third of the market about 43% of the time in February, March, and April and about 48% of the time in May. February has the lowest probability of having a price in the year's bottom-third at about 9% of the days over the last eighteen years (Figure 1).

While corn had a pronounced seasonal component for the last eighteen years, the November soybean contract does not show the same seasonal signal. The November soybean futures contract has traded in the top-third of the year's trading range about 42%, 49%, and 50% of the days in May, June, and July, respectively (Figure 2). The window for pre-harvest hedging is shifted to late spring or early summer compared to the winter and early spring for corn. Figure 2 reminds farmers selling at harvest that the November soybean contract has traded in the bottom-

third at harvest about 44% of the time. Farmers should strive to avoid selling soybeans at harvest unprotected to avoid capturing a price in the bottom-third of the market.

The July wheat futures contract has traded in the top-third of each year's price about 64% of the time in July the year before harvest (Figure 3). The concept of using the futures market to broaden the marketing window is demonstrated in the wheat market. The top-third is more likely in July (64%), August (57%), September (40%), and October (41%) of the days for the last eighteen crops (Figure 3). Farmers who are waiting for their winter wheat crop to emerge from dormancy before hedging are more likely to capture a price in the bottom-third of each year's trading range. The likelihood of being in the bottom-third is 44% in March and 58% in April (Figure 3).

Managers that dislike commodity futures because of margin calls or the inability to match expected production levels to the 5,000-bushel contract specification may consider using forward contracts before harvest. A forward contract locks in the futures price and the basis. Besides avoiding margin calls, managers have the flexibility to contract in quantities other than 5,000-bushel units. Hedging does not lock in a basis, so the risk of obtaining a wider than expected basis may make the returns from hedging less than that of forward contracting because of the basis risk.

Daily spot and forward bids for twelve Western Kentucky markets from 2001 to 2017 are used to evaluate the value of hedging or forward contracting corn, soybean, and wheat before harvest using market data from the Kentucky Farm Bureau Federation. Futures market data for the December corn, November soybeans, and July wheat futures are from the Commodity Research Bureau.

Results

The value of using hedging with commodity futures pre-harvest for corn for selected months are shown in Table 1. The hedged price of corn is compared to the cash price at harvest, which is assumed to be the average for October. The years where hedging provided risk management benefit is indicated by a positive value. Figure 1 suggests that managers implementing a hedge with the December corn futures contract had a 43% and 48% probability of the futures price being in the top-third of the year's price range in February and May, respectively (Figure 1).

Table 1 shows that hedging in February or in May provided, on average, positive value to corn price by \$0.17/bushel and \$0.20/bushel, respectively, for the 2001-2017 crop years (Table 2). The likelihood of the hedging having a positive value was about 70% for hedges implemented in February and in May. When the hedges “worked” by protecting against lower harvest-time prices, the average value of the hedge was \$0.60/bushel and \$0.66/bushel, respectively, for the hedges in February and in May (Table 2). Hedging for the 2015-17 crops provided positive value in February all three years and two of the three years for the May hedge. The corn hedge provided an additional \$0.38 and \$0.27/bushel, respectively, for the February and May hedge (Table 1).

Forward contracting provided a price above the harvest-time price in 70% of the years. Because forward contracts lock in a basis and futures price, the average value of forward contracts was slightly less than that of the hedge due to the basis variability (Table 2). However, the expected value of forward contracting when there was positive value was the same as hedging. The years when forward contracting did not work reinforces the concept of the risk of locking in a price before harvest. Some years, like the 2012 drought, was a mistake to forward contract as the harvest-time price was above the contracted price (Table 1).

Table 2 reinforces the seasonality shown in Figure 1 when analyzing the summary statistics for forward contracting corn in July. The average value was \$0.15/bushel from 2001 to 2017 (Table 2). The likelihood of the July forward contract price is larger than the harvest price is about 60% of the years, and the average benefit of forward contracting in July is slightly lower than forward contracting in May. Table 1 shows that forward contracting corn in July 2017 provided an additional \$0.59/bushel to the harvest price. While the contract price may not have covered total economic costs, the additional \$0.59/bushel was beneficial for bushels sold at harvest (Table 1).

Soybean's seasonal pattern since 2000 does not identify months that are apparently better for implementing hedges with the November soybean futures contract (Figure 2). With only a 25% likelihood of hedging at a price in the year's top-third trading range, hedging in February provided an average loss of \$0.08/bushel for the 2001 to 2017 crop years (Table 4). The average values from implementing hedges in May or July provided an average increase in the harvest price by \$0.14 and \$0.47/bushel, respectively, for the years studied (Table 4). The 2008 result distorts the value of the July hedge due to the economic meltdown that fall. Excluding the 2008 hedge, the July hedge had an average value of \$0.15/bushel. Entering into a soybean hedge in July provided a positive benefit 65% of the years with the average benefit of \$0.82/bushel when the 2008 return is excluded (Table 4).

Those looking to forward contract had similar returns as for hedging. The average benefit of forward contracting in May or July was \$0.11 and \$0.44 per bushel, respectively, for 2001 to 2017 (including the 2008 benefit). Farmers had an opportunity in July to forward contract at prices that were an average of \$0.70/bushel above the harvest price for the 2015 to 2017 crops (Table 3).

Wheat showed a seasonal pattern in the futures market with the top-third price in July the year before the crop is harvested 65% of the closing prices for the 2000 to 2017 crops (Figure 3).

Implementing a hedge in July or October planting provided an average benefit of \$0.38 and \$0.18/bushel, respectively (Table 6). The likelihood of the hedge implemented in July or October of being valuable was 71% and 76% of the years evaluated (Table 2). Waiting until January to implement a hedge had a lower probability of success but still provided an average benefit of \$0.22/bushel to the harvest price. The value of hedging the last three crops in July provided an average of \$0.75/bushel the last three years (Table 5). Waiting until October also provided a positive value of \$0.22/bushel for the 2015-2017 crops.

Forward contracting in October, January or March provided a price that was \$0.05, \$0.18, and \$0.19 per bushel on average, respectively, higher than the harvest price for the 2000 to 2017 crops (Table 6). Forward contracting has a lower probability of success as compared to hedging reflecting that locking in basis reduces the upside potential from a stronger basis but reduces the downside risk from a weak basis. Table 6 shows that forward contracting with wheat has a noticeably lower downside risk as compared to hedging with wheat. The risk-return trade-off for wheat is clear as hedging provides the higher return with greater variability in returns. Forward contracting is lower risk and lower average returns (Table 6).

Summary

The results remind farmers that pricing corn, soybeans, and wheat early in the production process, or even before planting, often provide a price that is higher than the do-nothing risk management strategy. The benefit of using futures to expand the pricing window is demonstrated for corn and wheat as elevators may not have competitive forward bids available while futures contracts may provide the better mechanism to transfer risk. The seasonality of a July weather

market in soybeans reminds farmers to consider pricing soybeans in expectation of a weather event during the crop's development.

While there is no strategy to guarantee profitability, managers should be proactive to protect bushels sold at harvest. The bottom-third prices are consistently at or near the harvest month. An excellent first step in price risk management is avoiding sales in the bottom-third. Then managers can attempt to implement a hedge in the top-third price range.

References

Commodity Research Bureau. "Daily Corn and Soybean Futures Data for All Contracts from 1980 to 2017." <http://www.crbtrader.com>. Accessed June 1, 2017.

Kentucky Farm Bureau Federation. "Daily Corn and Soybean Price Data for Western Kentucky Markets from 2000 to 2017." Email message to author. July 1, 2017.

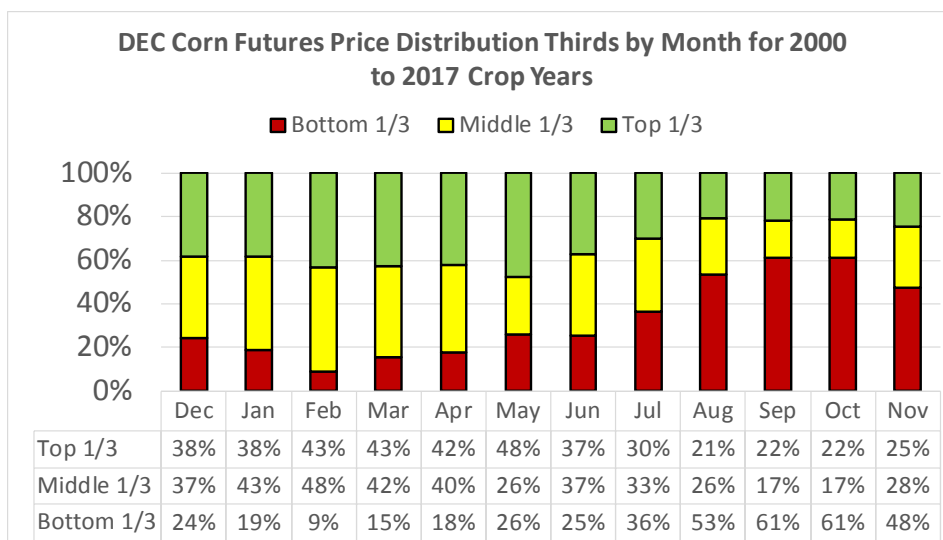


Figure 1. Probability of the December Corn Futures Contract Closing Price Trading in Each Year's Top Third, Middle Third and Bottom Third for the 2000 to 2017 Crop Years.

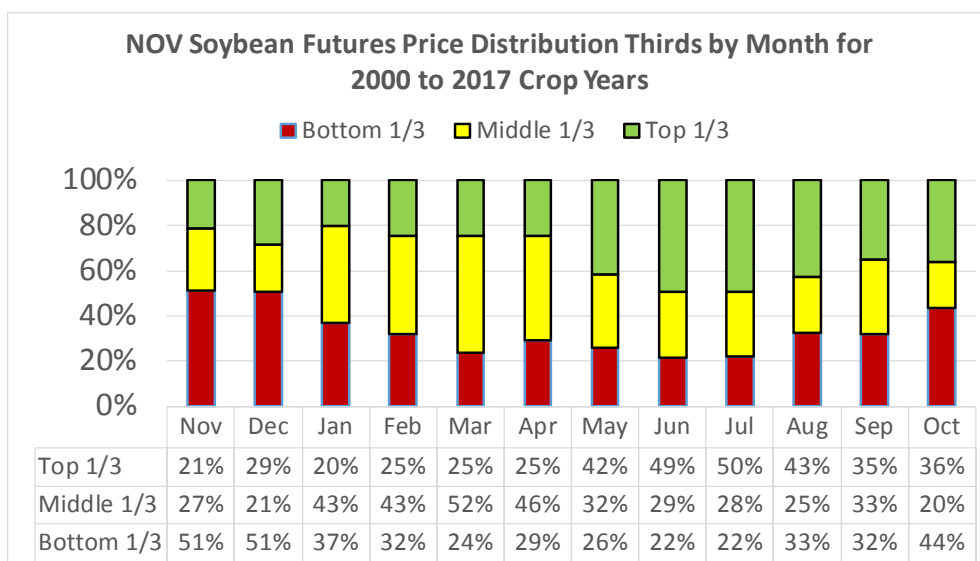


Figure 2. Probability of the November Soybean Futures Contract Closing Price Trading in Each Year's Top Third, Middle Third and Bottom Third for the 2000 to 2017 Crop Years.

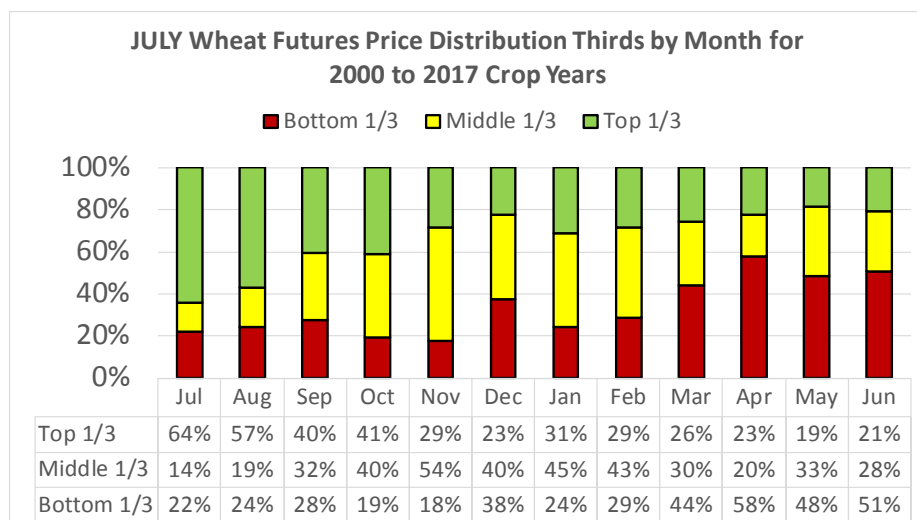


Figure 3. Probability of the July Wheat Futures Contract Closing Price Trading in Each Year's Top Third, Middle Third and Bottom Third for the 2000 to 2017 Crop Years.

Table 1. Value of Hedging and Forward Contracting Corn as Compared to Harvest Price for Western Kentucky for the 2001 to 2017 Crop Years.

Crop Year	Value of Hedge		Forward Contract Value		
	February	May	February	May	July
2001	+\$0.38	+\$0.10	+\$0.38	+\$0.11	+\$0.21
2002	-\$0.20	-\$0.28	-\$0.43	-\$0.50	-\$0.27
2003	+\$0.17	+\$0.18	+\$0.11	+\$0.12	-\$0.16
2004	+\$0.78	+\$0.90	+\$0.86	+\$0.98	+\$0.47
2005	+\$0.29	+\$0.28	+\$0.42	+\$0.41	+\$0.61
2006	-\$0.44	-\$0.29	-\$0.56	-\$0.44	-\$0.57
2007	+\$0.48	+\$0.17	+\$0.39	+\$0.03	-\$0.34
2008	+\$1.27	+\$2.13	+\$1.33	+\$2.09	+\$2.34
2009	+\$0.32	+\$0.70	+\$0.06	+\$0.50	-\$0.45
2010	-\$1.47	-\$1.60	-\$1.48	-\$1.62	-\$1.55
2011	-\$0.31	+\$0.25	-\$0.55	+\$0.03	+\$0.14
2012	-\$1.82	-\$2.27	-\$1.99	-\$2.42	-\$0.04
2013	+\$1.26	+\$1.01	+\$1.34	+\$1.11	+\$0.68
2014	+\$1.12	+\$1.36	+\$1.36	+\$1.61	+\$0.60
2015	+\$0.32	-\$0.05	+\$0.24	-\$0.09	+\$0.30
2016	+\$0.36	+\$0.47	+\$0.30	+\$0.46	+\$0.06
2017	+\$0.46	+\$0.39	+\$0.55	+\$0.49	+\$0.52

Table 2. Summary Statistics for Pre-Harvest Hedging and Forward Contracting Corn Compared to the Harvest-Cash Price for Western Kentucky for the 2001 to 2017 Crop Years.

	Value of Hedge		Forward Contract Value		
	February	May	February	May	July
2001-17 Avg	+\$0.17	+\$0.20	+\$0.14	+\$0.17	+\$0.15
Prob > 0	71%	71%	71%	71%	59%
Value > 0	+\$0.60	+\$0.66	+\$0.61	+\$0.66	+\$0.59
Prob < 0	29%	29%	29%	29%	41%
Value < 0	-\$0.85	-\$0.90	-\$1.00	-\$1.01	-\$0.48

Table 3. Value of Hedging and Forward Contracting Soybean as Compared to Harvest Price for Western Kentucky for the 2001 to 2017 Crop Years.

Crop Year	Value of Hedge			Forward Contract Value		
	February	May	July	February	May	July
2001	+\$0.29	-\$0.06	+\$0.63	+\$0.20	-\$0.12	+\$0.61
2002	-\$0.95	-\$0.78	-\$0.20	-\$1.12	-\$0.91	-\$0.30
2003	-\$2.06	-\$1.70	-\$2.06	-\$2.08	-\$1.70	-\$2.02
2004	+\$1.45	+\$1.99	+\$1.02	+\$1.44	+\$1.99	+\$1.00
2005	-\$0.21	+\$0.59	+\$1.27	+\$0.11	+\$0.91	+\$1.51
2006	+\$0.25	+\$0.26	+\$0.22	+\$0.18	+\$0.13	+\$0.01
2007	-\$1.67	-\$1.70	-\$0.94	-\$1.55	-\$1.69	-\$1.26
2008	+\$4.14	+\$3.79	+\$5.70	+\$4.00	+\$3.51	+\$5.27
2009	-\$0.86	+\$0.34	-\$0.37	-\$1.43	+\$0.07	-\$0.55
2010	-\$2.40	-\$2.36	-\$2.02	-\$2.43	-\$2.34	-\$1.86
2011	+\$1.35	+\$1.26	+\$1.51	+\$1.35	+\$1.10	+\$1.38
2012	-\$2.84	-\$2.22	+\$0.34	-\$2.95	-\$2.23	+\$0.42
2013	+\$0.00	-\$0.54	-\$0.33	-\$0.02	-\$0.46	-\$0.26
2014	+\$1.72	+\$2.68	+\$1.32	+\$1.78	+\$2.72	+\$1.40
2015	+\$0.82	+\$0.40	+\$1.01	+\$0.67	+\$0.28	+\$0.89
2016	-\$0.90	+\$0.67	+\$0.62	-\$0.63	+\$0.68	+\$0.69
2017	+\$0.43	-\$0.20	+\$0.34	+\$0.78	+\$0.02	+\$0.53

Table 4. Summary Statistics for Pre-Harvest Hedging and Forward Contracting Soybeans Compared to the Harvest-Cash Price for Western Kentucky for the 2001 to 2017 Crop Years.

Crop Year	Value of Hedge			Forward Contract Value		
	February	May	July	February	May	July
2001-17 Avg	-\$0.08	+\$0.14	+\$0.47	-\$0.10	+\$0.11	+\$0.44
Prob > 0	53%	53%	65%	53%	59%	65%
Value > 0	+\$1.16	+\$1.33	+\$1.27	+\$1.17	+\$1.14	+\$1.25
Prob < 0	47%	47%	35%	47%	41%	35%
Value < 0	-\$1.49	-\$1.20	-\$0.99	-\$1.53	-\$1.35	-\$1.04

Table 5. Value of Hedging and Forward Contracting Wheat as Compared to Harvest Price for Western Kentucky for the 2001 to 2017 Crop Years.

Crop Year	Value of Hedge			Forward Contract Value		
	July	Oct	Jan	Oct	Jan	Mar
2001	+\$0.43	+\$0.43	+\$0.47	+\$0.47	+\$0.39	+\$0.22
2002	+\$0.22	+\$0.03	+\$0.08	-\$0.05	-\$0.01	-\$0.12
2003	+\$0.10	+\$0.20	-\$0.04	+\$0.23	-\$0.12	-\$0.26
2004	-\$0.31	-\$0.20	+\$0.32	-\$0.23	+\$0.31	+\$0.41
2005	+\$0.31	+\$0.05	-\$0.12	-\$0.07	-\$0.13	+\$0.28
2006	-\$0.06	-\$0.12	-\$0.20	+\$0.16	+\$0.04	+\$0.13
2007	-\$1.23	-\$1.09	-\$0.91	-\$1.11	-\$0.90	-\$1.01
2008	-\$2.81	-\$1.73	-\$0.05	-\$0.34	+\$1.07	+\$2.58
2009	+\$3.07	+\$0.37	+\$0.33	-\$0.36	+\$0.11	-\$0.38
2010	+\$1.43	+\$0.90	+\$0.97	+\$0.15	+\$0.64	+\$0.14
2011	-\$0.55	+\$0.49	+\$1.55	-\$0.34	+\$0.95	+\$0.28
2012	+\$1.20	+\$0.43	+\$0.09	+\$0.07	-\$0.06	+\$0.01
2013	+\$1.36	+\$1.63	+\$0.95	+\$1.37	+\$0.71	+\$0.19
2014	+\$1.01	+\$1.01	-\$0.07	+\$0.78	-\$0.17	+\$0.77
2015	+\$0.95	+\$0.20	+\$0.33	+\$0.00	+\$0.37	+\$0.04
2016	+\$0.91	+\$0.46	+\$0.09	+\$0.30	+\$0.07	+\$0.01
2017	+\$0.38	+\$0.01	-\$0.02	-\$0.27	-\$0.20	-\$0.13

Table 6. Summary Statistics for Pre-Harvest Hedging and Forward Contracting Wheat Compared to the Harvest-Cash Price for Western Kentucky for the 2001 to 2017 Crop Years.

Crop Year	Value of Hedge			Forward Contract Value		
	July	Oct	Jan	Oct	Jan	Mar
2001-17 Avg	+\$0.38	+\$0.18	+\$0.22	+\$0.05	+\$0.18	+\$0.19
Prob > 0	71%	76%	59%	53%	59%	71%
Value > 0	+\$0.95	+\$0.48	+\$0.52	+\$0.39	+\$0.47	+\$0.42
Prob < 0	29%	24%	41%	47%	41%	29%
Value < 0	-\$0.99	-\$0.79	-\$0.20	-\$0.35	-\$0.23	-\$0.38