Kevin Dhuyvetter and Terry Kastens

Marketing Grain — Things to Think About

Can you or your market advisor beat the market? Most previous research generally has shown that grain markets are efficient. This means that consistently "beating the market" from routine selling strategies is difficult. Does this mean that you should not worry about making marketing decisions? Regardless of whether grain markets are efficient or not, the reality is that if you produce a crop you have to make marketing decisions. This session discusses issues related to crop marketing, such as seasonal price patterns for both cash and futures markets, historical returns to grain storage, forecasting basis, and the costs of forward contracting. The objective is to help producers better understand some of the aspects of the grains markets so that more informed marketing decisions can be made in the future.

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The topic of grain marketing is one that always garners much attention, both from a research standpoint as well as in the popular press. One does not have to read very many farm magazines to find a quote about the importance of marketing and how it is a management trait that differentiates the successful producers from the unsuccessful ones. However, the importance of marketing is often less clear when one looks through the research (e.g., Wisner, Blue, and Baldwin; Zulauf and Irwin). The debate about the importance of marketing often revolves around whether or not people (producers or marketing advisors) can consistently garner higher prices than average (i.e., "beat the market"). Two important points need to be made that are independent of this debate. First, if farmers produce a crop they do have to market it and thus marketing cannot be ignored, and second, marketing grain is a continuum of activities.

Figure 1 displays a list of marketing-related activities that producers face. While this list is not necessarily all inclusive of every marketing issue producers face, it does identify those most often discussed and analyzed. The activities are listed in order as to how they relate to market efficiency. The concept of market efficiency refers to how easy it is to "beat the market" or profit from one's decisions on average. This figure indicates that price forecasting in a manner that is profitable is extremely difficult to do. On the other hand, marketing identity preserved grains or selling for income tax or cash flow reasons are classified as being less efficient and thus something producers can profit from on average.

Figure 1

Several other points need to be made about figure 1. First, the higher up in the list, the larger the profits are for being right (likewise the larger the loss from being wrong). However, the probability of consistently being right decreases as you move up the list. For example, if a person can consistently forecast prices accurately, the returns to doing so would be quite large (e.g., $1/bu), but the probability of doing so is quite low. On the other hand, a person who consistently markets crops for income tax management purposes may be able to pick up a small amount (e.g., 5¢/bu) consistently from year to year. Given that talking about small gains is not very glamorous, most stories and discussions about marketing tend to hinge around topics higher up on the list. A second point about figure 1 is that those activities lower on the list (i.e., those characterized as being less efficient) tend to be more local in nature where features can be contrary to larger markets. That is, producers may be able to profit from their decisions because what they do has very little impact on the overall market.

This paper examines several of the marketing-related activities listed in figure 1 in more detail, with the objective of helping producers identify where they should spend their marketing-related management efforts. As already noted, it is important to recognize that marketing grain is a complex process that involves many different activities. Thus, this paper is not intended to provide a "solution" as to what individual producers should do with regards to marketing their crops. Rather, it is intended to provide "food for thought" as they think about how best to spend their limited management time.

Price Forecasting and Market Advisors

The top two categories in figure 1 are related in that they both have to do with the ability to forecast prices. Obviously, if an individual can consistently forecast prices accurately, he could profit from this expertise quite well (i.e., trade the market). But, do we have evidence that producers or market advisory services (MAS) can do this?

Figure 2 shows how various management measures vary when ranked by top- and bottom-thirds based on approximately 1,000 farms continuously enrolled in the Kansas Farm Management Association (KFMA) from 1992 through 2001. All management measures are defined as "percent different" from the average except profit, which is defined as dollars per acre. Based on these data, there are much greater differences between the top- and bottom-ranked producers with regard to cost and yield than with price. For example, the third of producers having the lowest costs (after accounting for crop type) have costs that are 26% below the average compared to only a +9% advantage for the top-third of producers in the price category. Furthermore, differentiating oneself from others is much easier to do with regards to costs as compared to price (Kastens, Dhuyvetter, and Nivens). These data suggest that individual producers are not particularly good at picking prices relative to other producers, as there is very little difference between the average price received by the top- and bottom-thirds. In any given year there might be a large difference in prices between producers, but that is not particularly useful if it cannot be repeated over time (i.e., it may simply be a random event).

Variability of Management Measures:
Average Value in High and Low Thirds (1992-01)*

Measure	High third	Low third
Profit	+$78	-$81
Cost	+32%	-26%
Yield	+15%	-16%
Price	+9%	-9%
Planting intensity	+25%	-31%
Rent	+50%	-58%
Farm size	+88%	-72%

Figure 2

Based on KFMA enterprise specific data over a much shorter time frame (1999-2001), Albright concluded that most of the difference (84%) between the top- and bottom-third producers with regard to profitability was due to costs and not price. In a similar study in Illinois, Schnitkey concludes that some farms are consistently more profitable than others and that these farms are characterized as being larger, having slightly higher yields, and having lower costs than the less profitable farms (figure 3). While these studies do not indicate that individual producers who can

Low- vs High-Profit Groups in Illinois
(Six-year average return – Source: University of Illinois)

Trait/category	Low group	High group
Total acres	672	1,007
Owned	171 (25%)	74 (7%)
Share rent	311 (46%)	789 (78%)
Cash rent	190 (28%)	144 (14%)
Total costs ($/A)	$430	$340
Land	133	98
Power	71	55
Buildings	23	19
Labor	50	30
Variable inputs	99	92
Other	54	46
Yield (bu/A)		
Corn	148	160
Soybeans	47	50
Prices ($/bu)		
Corn	$2.48	$2.50
Soybeans	$6.25	$6.02

Figure 3

consistently forecast prices accurately do not exist, they do provide evidence that, on average, costs are typically more important than prices in explaining the relative economic success of a farm.

There is good reason to understand why producers might not be particularly good as predicting prices given the complexities of markets and the vast amount of information to digest and analyze. Thus, maybe a better question is, How well can economists and market advisors predict prices? In an analysis of USDA and Extension economists, Kastens, Schroeder, and Plain found that experience does not improve the accuracy of forecasters. They also concluded that Extension is no more accurate than USDA and neither group was more accurate than the futures market. Brorsen and Irwin argue that Extension should move away from predicting prices and let market advisory consultants take over this role as they are better equipped to provide market information and price projections to producers in a timely fashion.

The AgMAS project at the University of Illinois is a formal research project to evaluate the pricing performance of market advisory services (MAS). This project calculates the harvest equivalent price producers would receive if they followed the marketing recommendations of 20-30 participating MAS. AgMAS evaluates prices for corn, soybeans, 50/50 revenue (corn and soybean rotation), and wheat. In addition to calculating net prices received for each of the participating MAS, AgMAS also calculates several benchmark prices (24-month price, 20-month price, and a weighted average price based on farmer marketings). While it can be debated as to which benchmark price should be used, the 24-month is reported here as it is influenced the least by the short time period analyzed (7 years).

Figures 4-6 show the AgMAS results for the 15 different MAS that have been evaluated each year from 1995-2001 for corn, soybeans and 50/50 revenue, respectively (Irwin, Martines-Filo, and Good). There is a 43¢ per bushel difference between the best ($2.60/bu) and worst ($2.17) MAS prices for corn. The average price across all advisors was $2.32, which compares to the 24-month benchmark price of $2.27. Nine of the 15 MAS had a 7-year average selling price that was greater than the benchmark. The average difference between the best and worst MAS for soybeans was 86¢ per bushel ($6.65 vs. $5.79). The average selling price of the MAS was $6.09 compared to the benchmark price of $6.03. Ten of the 15 MAS had a 7-year average selling price equal to or greater than the benchmark price. Given that the average MAS price was greater than the benchmark for both corn and soybeans (figures 4 and 5), this suggests that if producers were to randomly choose a MAS they could expect to receive a price at least as high as the benchmark.

Because most producers likely would hire the same marketing advisor for both corn and soybeans, the performance with regards to 50/50 revenue is the more relevant measure. Figure 6 shows that the difference between the best and worst MAS was $41/acre by this measure. The average across all MAS was $312/acre, which is slightly less than the 24-month benchmark revenue of $314. In this case, only four of the 15 MAS had revenue that was equal to or greater than the benchmark. Thus, it appears that the MAS that do well in the corn market do not fare so well in soybeans and vice versa. Based on this, it appears that a producer who randomly chooses a MAS for both corn and soybeans should not expect the revenue from both crops to be any better than simply selling at average prices (i.e., the benchmark).

Figure 7 shows the AsMAS results for the 17 MAS that have been evaluated for wheat over the 5-year period 1995-1999 (Martines-Filho, Good, and Irwin). While there is still a rather large difference (52¢

per bushel) between the best and worst MAS, it can be seen that, as a group, the advisors perform much more poorly in the wheat market than in the corn and soybean markets. The average price for the 17 advisors is $3.06/bu compared to the benchmark price of $3.19, indicating that if a producer chose a random MAS he would expect to be worse off than simply selling at the average market price. In the case of wheat, six of the 17 advisors had a price greater than or equal to the benchmark price. However, the price of the best MAS was only 12¢ per bushel greater than the benchmark price.

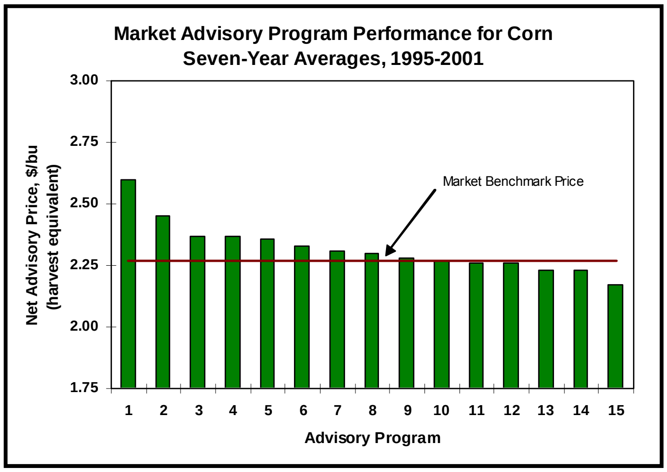
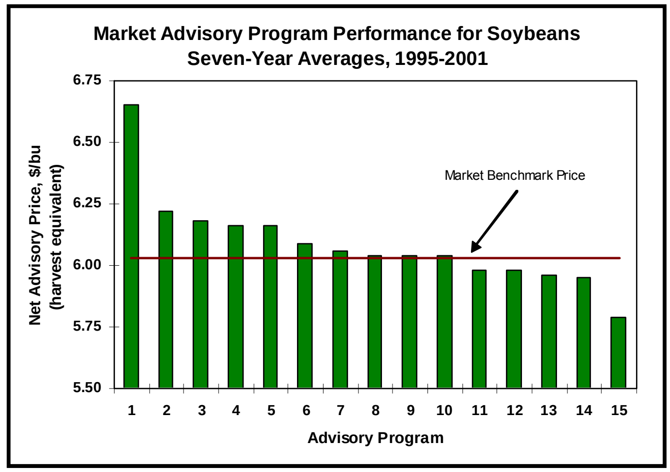


Figure 4



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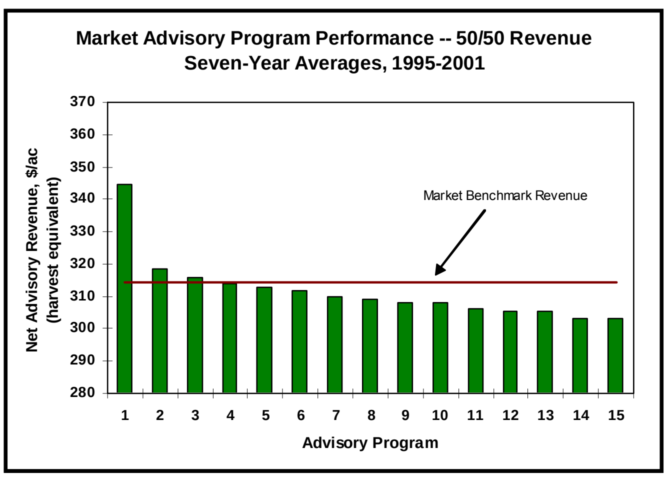

Figure 6

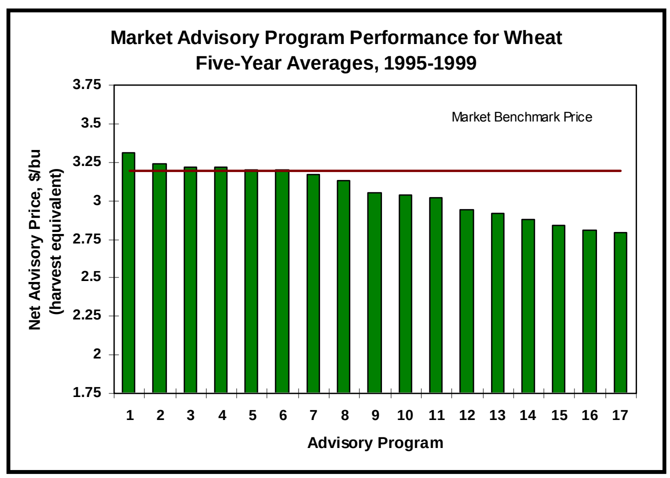

Figure 7

In addition to the AgMAS project, the farm magazine *Top Producer* also has an on-going project comparing various MAS. While this project does not track as many advisors, and though its analytical procedure is not quite as rigorous as that of AgMAS, the results from this analysis represent additional information available to producers. Figures 8 and 9 show the *Top Producer* prices and its benchmarks for five MAS for the 1995-2001 corn and soybean crops, respectively. In addition to the *Top Producer* results, these figures show the AgMAS results for the same five advisors.[1] Several key points emerge from figures 8 and 9. The first one is that absolute levels of both the MAS prices and the benchmark prices vary considerably between the two analyses, but differences are not consistent across crops. For example, the *Top Producer* MAS prices for corn are considerably higher than the AgMAS MAS prices, but the *Top Producer* benchmark is lower than the AgMAS benchmark price. On the other hand, both the AgMAS MAS and benchmark prices are considerably higher than the *Top Producer* prices for soybeans. When comparing the average price across the five MAS to the benchmark price for corn, the *Top Producer* analysis suggests the MAS received a 30¢ per bushel premium, whereas, the AgMAS results suggest MAS, on average, received 4¢ per bushel less. For soybeans, the average MAS price compared to the benchmark price was similar for both analyses — AgMAS results indicate MAS received a 12¢ premium and *Top Producer* results indicate a 15¢ premium.

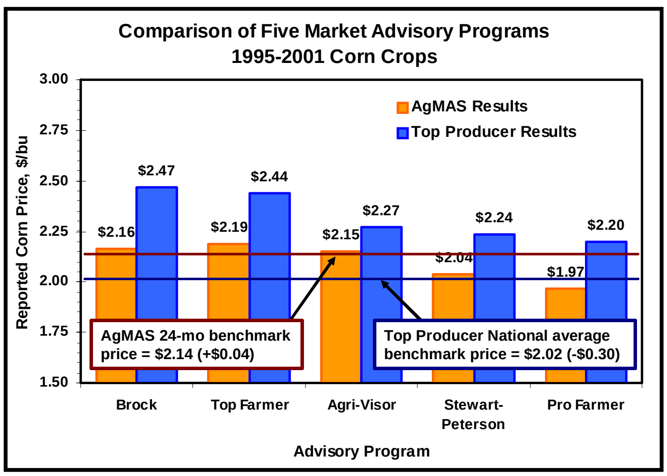

Figure 8

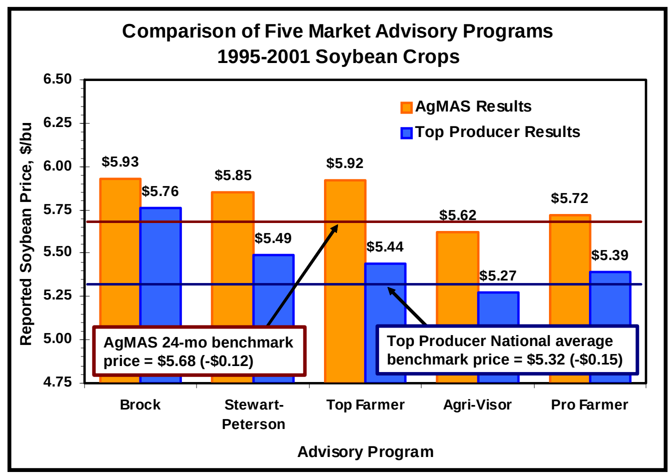

Figure 9

Another, although less revealing, feature to consider from figures 8 and 9 is that the relative rankings of some individual advisors change between the two analyses. For corn, the rankings are fairly consistent between the two analyses, with the exception of the top two (Brock and Top Farmer) switching places. However, with soybeans, there are some changes that are a little more significant. For example, Top Farmer is the third ranked advisor in the Top Producer study, whereas, it is essentially tied for first in the AgMAS project. The bottom line is that producers have information from several sources to consider when evaluating the performance of MAS, and this information may be conflicting.

Picking a Market Advisory Service

How should producers pick a market advisory service? In a survey of 1,285 crop producers from the Midwest, Great Plains, and Southeast regions of the U.S., Isengildina et al. found that respondents switched MAS once every 3.3 years. Slightly over a fourth of the survey respondents (28%) reported

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[1] Some advisors have multiple programs that are analyzed individually in the AgMAS project (e.g., Brock cash and Brock hedge). The results reported by *Top Producer* did not distinguish specific programs thus the AgMAS results reported in figures 8 and 9 are the average across all programs for the individual advisors.

they had never switched MAS, and the authors suggested the other 72% of MAS users may be chasing the "hot advisor." In figures 4 and 5, the top ranked advisor for corn and soybeans was the same firm (Ag Resource) suggesting this one particular firm has been consistently outperforming many of the firms. However, if the results are looked at on an annual basis the story is less clear. Figure 10 shows the top 5 MAS with regards to the 50/50 revenue (figure 6) year by year. The best MAS on average (Ag Resource) had the highest revenue 4 of the 7 years, but the other three years they were close to the bottom. Likewise, the 5th ranked MAS on average (Brock hedge) had the highest revenue 2 of the 7 years. Figure 10 makes it clear how risky it can be to choose a MAS in real-time if the selection criteria is based upon pricing performance.

Isengildina et al. reported that only 11% of the MAS subscribers closely follow the specific pricing recommendations of the MAS. Rather they rely heavily upon the MAS for market information, market analysis, and to keep up with the markets. They also found that a match between the marketing philosophy of the farmer and the marketing style of the MAS was important. That is, producers may subscribe to a particular advisory firm due more to the marketing style and general market information being provided than because of actual pricing performance. Thus, results such as those in figures 4-10 may play only a small part in the ultimate choice of a MAS.

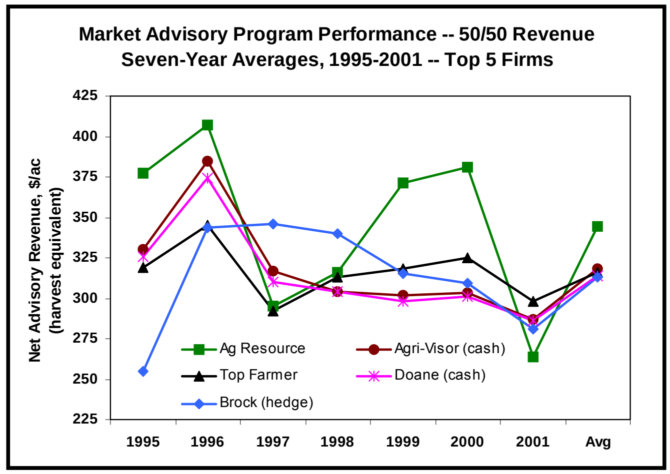

Figure 10

Seasonal Cash Prices

After forecasting prices and picking a MAS, the next marketing topic listed in figure 1 is seasonal prices. Price seasonality simply refers to the fact that prices tend to follow patterns throughout the year that are somewhat predictable. The reason for seasonal price patterns is quite obvious – we produce a crop at one time of the year (i.e., harvest), but we consume that crop throughout the year. This implies that seasonal price patterns are a function of supply (crop size) and demand (consumption) which vary from year to year. Therefore, fundamental factors that affect absolute price levels will also affect and drive seasonal price patterns.

Seasonal price patterns typically are examined by calculating a seasonal price index using monthly data. A seasonal index merely is a way of normalizing data across years given that price levels vary significantly from year to year. Seasonal indices typically are calculated first on an annual (crop year) basis where the monthly average price is divided by the annual average, and then these annual indices are averaged across years. Because this multiple-year average represents our expectation for future seasonal patterns, we typically assume more data are preferred to less (i.e., include as many years as possible). However, if there are structural changes impacting the fundamentals of a market, then fewer years may be better (i.e., historical data that no longer reflect market fundamentals should be excluded from the average). Figures 11-14 show the seasonal price indices for wheat, corn, milo, and soybeans in

Central Kansas for the last 30 crops years (31 for wheat).[2]

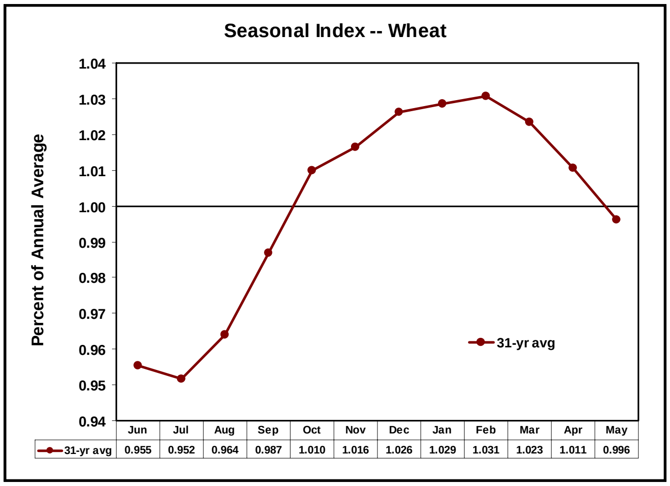

Figure 11

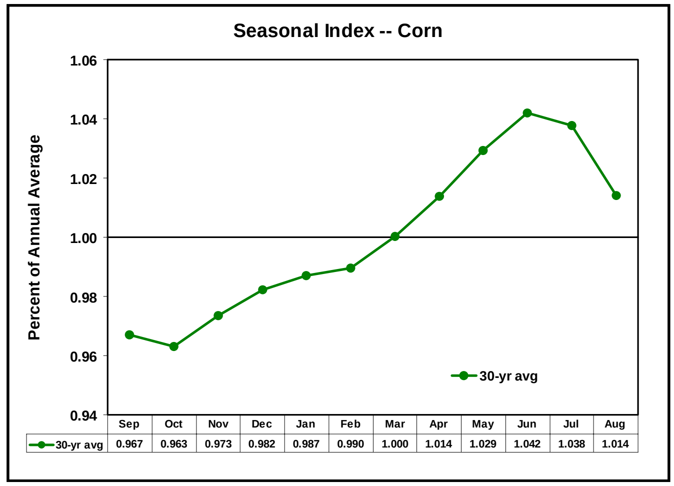

Figure 12

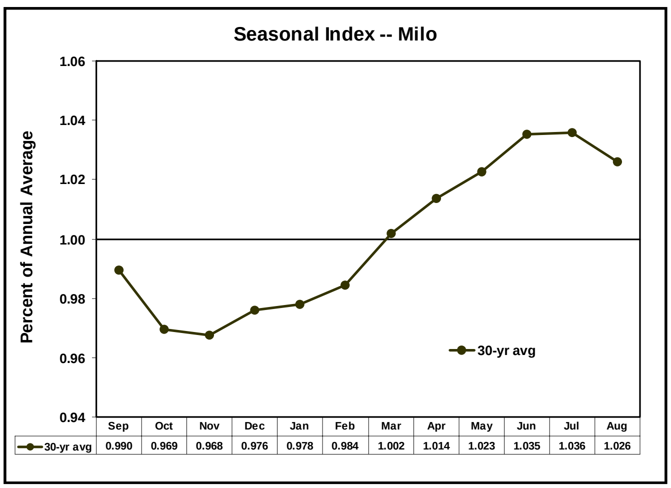

Figure 13

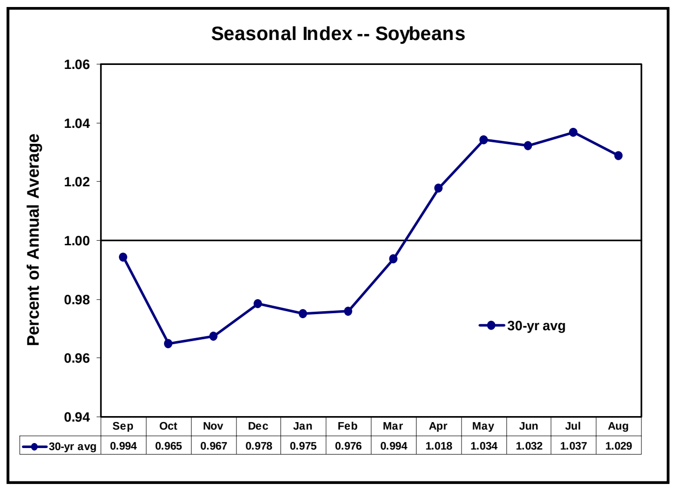

Figure 14

It can be seen from figures 11-14 that prices are below the annual average (i.e., less than 1.0) at harvest and then prices increase throughout the year. For example, wheat prices in July have averaged 95.2% of the annual average over the last 31 crop years and then increased to 102.9% of the annual average in January. The following is an example of how this information might be used to examine expected price changes for wheat from harvest until January:

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[2] Prices used to calculate seasonal indices are Crop Reporting District prices as reported by Kansas Agricultural Statistics. An Excel spreadsheet that can be used to examine historical prices and seasonal price patterns for all nine regions of Kansas is available at www.agmanager.info/crops/marketing/databases/.

	Price of wheat in July	\$2.80/bu
÷	July seasonal index	0.952
=	Annual price of wheat	\$2.94/bu
x	January seasonal index	1.029
=	Price of wheat in January	\$3.03/bu
=	Gross return to storage	\$0.23/bu

Because prices are known to follow different seasonal patterns in short-crops years, seasonal indices often are calculated separately for normal and short-crop years. Figures 15-17 show the seasonal patterns for short-crop and normal-crop years for corn, milo, and soybeans, respectively.[3] Not surprisingly, the patterns in short-crop years are much different than normal years. That is, prices tend to be high at harvest and then remain steady or fall throughout the year. This difference between normal and short-crop years is important to know if seasonal indices are being used to predict price movements as in the example above. However, if seasonal price indices are used to determine how much prices are expected to increased over time for making grain storage investment decisions, then the average indices across all years (i.e., figures 11-14) should be used.

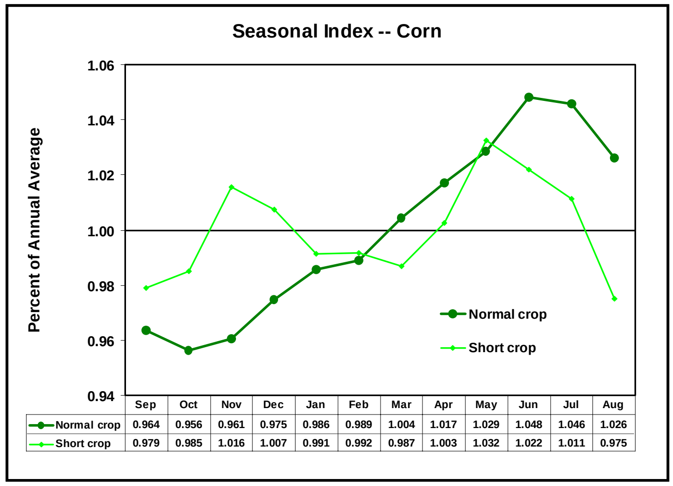

Figure 15

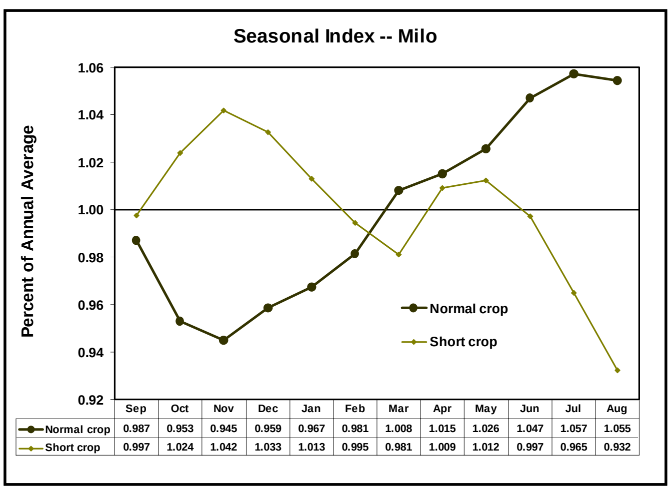

Figure 16

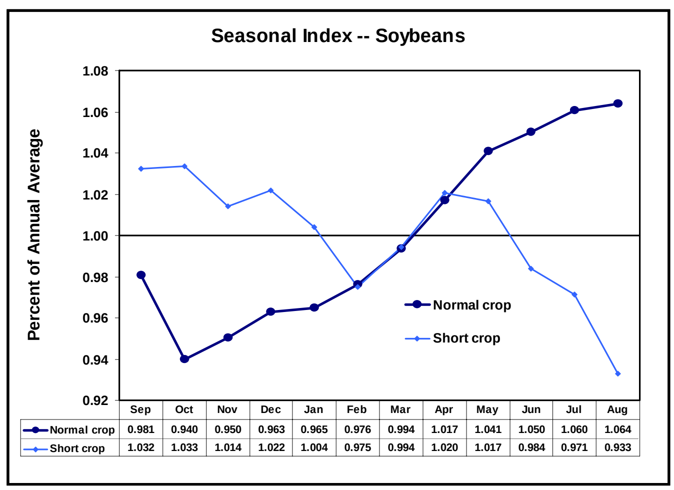

Figure 17

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[3] Because of the way the wheat market is integrated across countries, classifying wheat crops as short-crop years has less meaning and thus a figure for wheat is not included. Years classified as being short crops years for corn are 1974, 1980, 1983, 1988, 1993, 1995, and 2003. Short-crop years for soybeans are the same as corn with the addition of 1996. Classifications of short-crop years are from Bob Wisner at Iowa State University.

A final consideration when calculating seasonal price indices is to look at historical variability. This can be done by looking at minimum and maximum values over some time period or by using the statistical measure, standard deviation. Figures 18-21 show long-term average indices and +/– one standard deviation values for wheat, corn, milo, and soybeans, respectively. The range between the average and +/– one standard deviation is expected to capture 68% of the individual observations. Thus, in the case of wheat, while we expect the price in July to be 95.2% of the annual average, 68% of the time it will be between 82.8% and 107.5%. This same high level of variability in the seasonal index holds for all four of the crops.

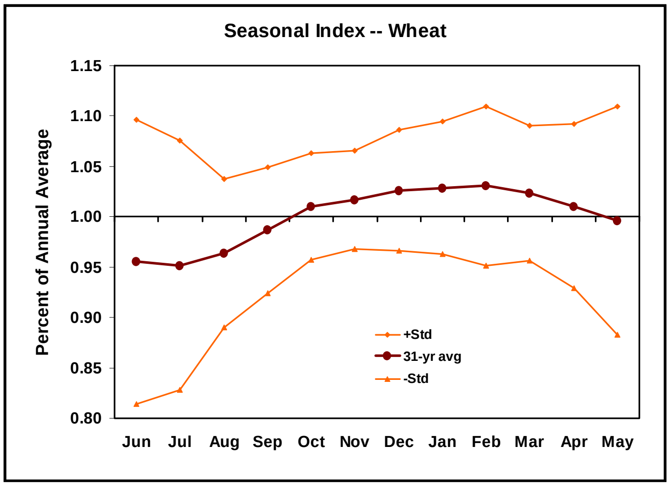

Figure 18

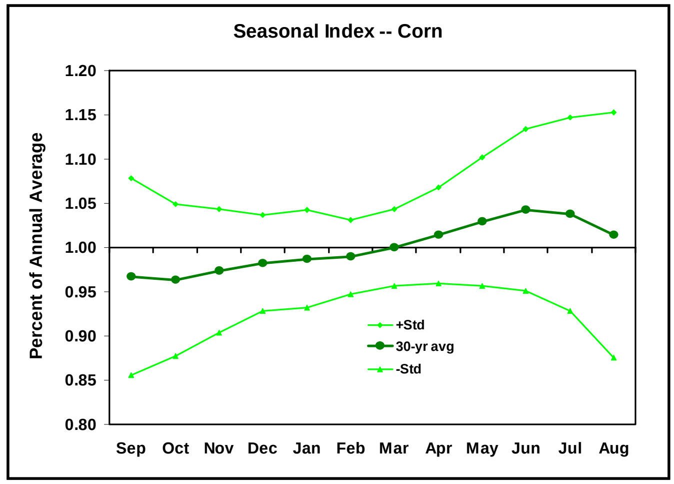

Figure 19

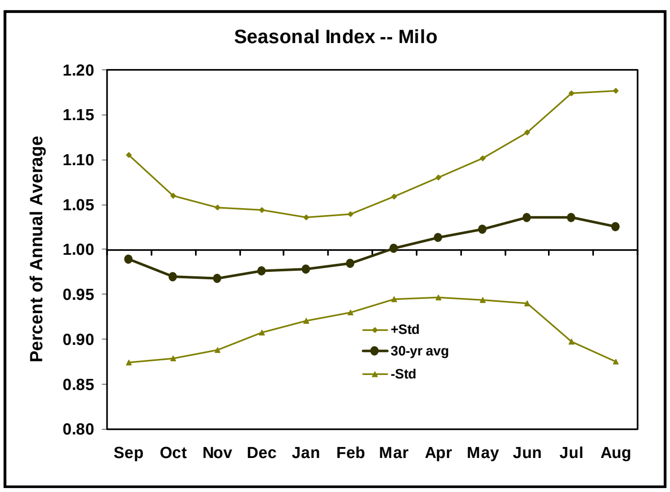

Figure 20

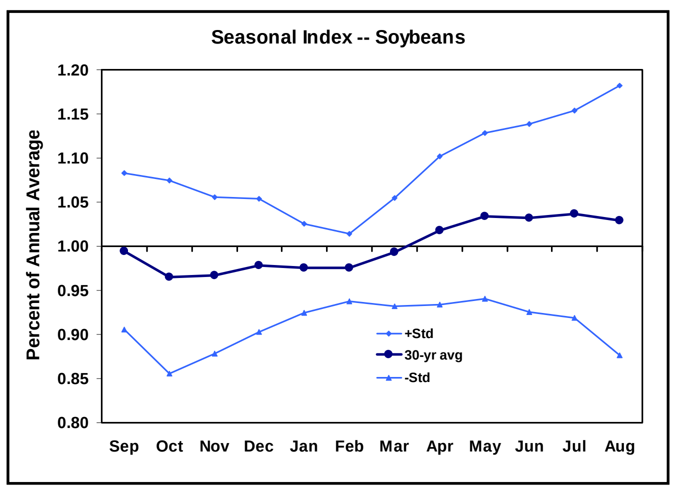

Figure 21

The variability in the seasonal index is highest at and right preceding harvest and it is lowest 4-5 months after harvest. This is expected, as it reflects when the uncertainty regarding the size of the crop is highest and lowest. The information in figures 18-21 is not particularly interesting in the sense that there is not much a producer can do about it, but it is important to recognize that, while cash prices do follow seasonal patterns on average, these patterns are extremely variable from year to year.

Returns to Grain Storage

Given that the seasonal price patterns depicted in figures 11-14 represent post-harvest price movements, a logical question is, Do prices increase enough to justify storing grain? Keep in mind that in a competitive (and efficient) market we expect price to equal cost, such that no true profits exist. Thus, our expectation is that seasonal price increases are likely very close to the cost of storing grain. Historical returns to storing grain were calculated for wheat, corn, milo, and soybeans using Wednesday weekly cash prices from 1982 through 2004 for Hutchinson, Kansas. All prices were converted to a 48-week year by average the 4th and 5th weeks for any months having five Wednesdays. Storage costs were assumed to be at the commercial rate of 2.6¢ per bushel per month (converted to a weekly basis) and using an interest rate equal to the Commodity Credit Corporation (CCC) rate. Commercial storage rates were used as this requires less assumptions about number of bushels being stored, etc. For more information on the cost of on-farm storage see Dhuyvetter, Hamman, and Harner.

Figures 22-25 show the 21-year average (22 in the case of wheat) weekly returns to storage for wheat, corn, milo, and soybeans, respectively. Historical returns to storing wheat are at their highest, at about 10¢ per bushel, when wheat is stored from harvest until the October to January time frame. Average returns to storage become negative if wheat is stored past January. Average returns to storing corn are maximized at about 5¢ per bushel when the corn is only stored one to two months after harvest. Returns also are positive (but not statistically significant at the 80% level) if corn is stored until May, however, the returns are still less than a nickel per bushel. The pattern for returns to storing milo is similar to corn (i.e., best 1-2 months and again in April/May). However, the difference is that none of the weeks had positive returns. That is, on average, storing milo does not pay in terms of seasonal price changes after harvest. The returns to storing soybeans follow a similar pattern to corn in that there are positive returns for storing 1-2 months and then again in early summer. With soybeans there is a little more incentive to store longer, as average returns are maximized at about 16¢ per bushel in mid-May and returns stay positive into June.

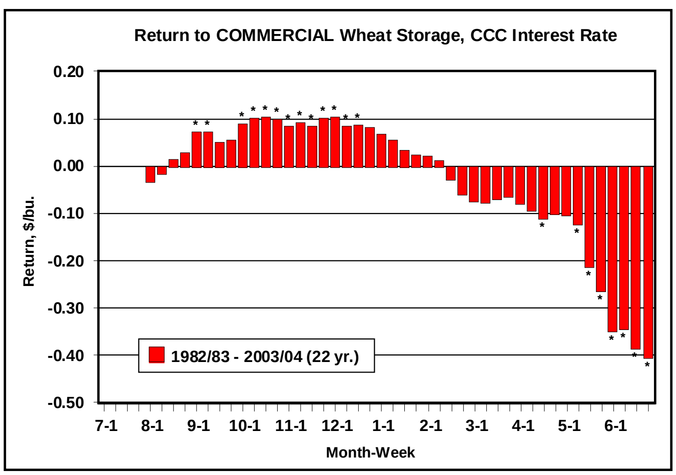

Figure 22

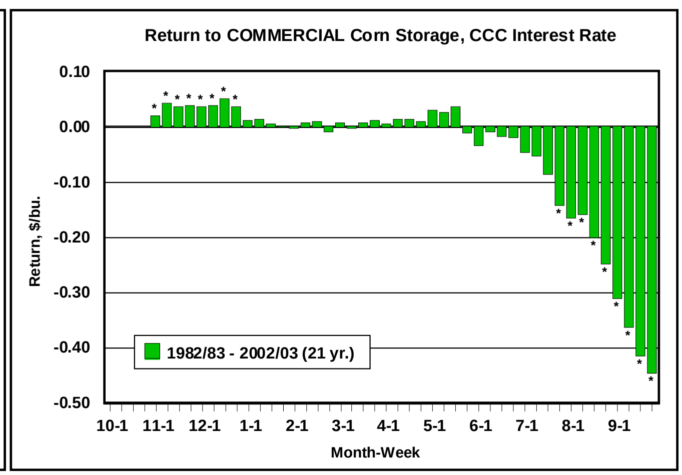

Figure 23

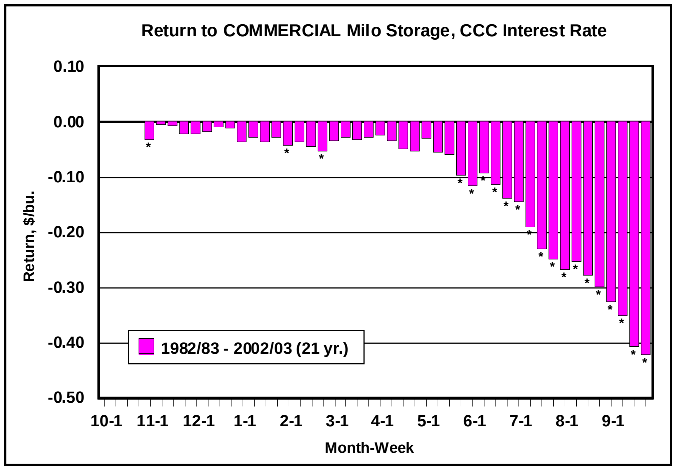

Figure 24

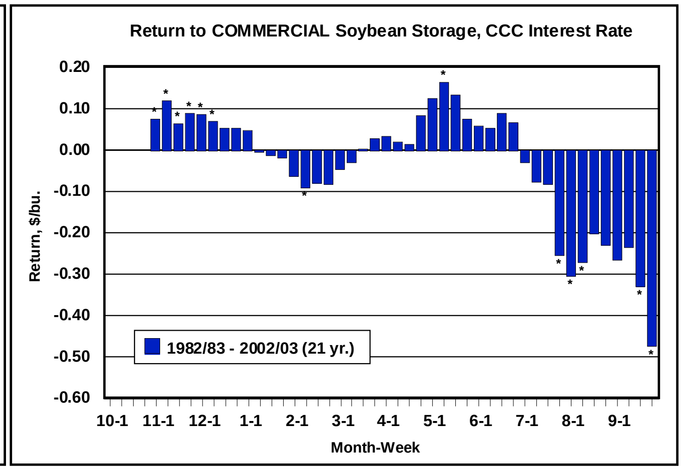

Figure 25

Figures 22-25 represent the long-term average and thus can be viewed as expected returns to storage, however, similar to previous discussions, producers should also consider the variability in returns. By examining variability producers can get a feel for the level of confidence they have in the average and also the risk involved. Figures 26-29 show the returns to storage by year for a specific week for each crop -- wheat, week 45 (1st week of December); corn, week 17 (1st week of May); milo, week 13 (1st week of April); and soybeans, week 18 (2nd week of May).[4] A quick look at all four figures reveals how variable the returns to grain storage are. For example, the returns to storage for wheat until week 45 have ranged from +$1.00 to -$1.08 per bushel and, though returns averaged a positive 10¢, they were negative eight of the 22 years. The returns to storing corn, milo, and soybeans also have been extremely variable, with the range between the best and worst years being $1.95, $1.37, and $3.36 per bushel, respectively. Because the weeks being analyzed for these three crops are in April and May, the average reported here includes 2004, whereas, in figures 23-25 it did not. It can be seen how much adding data from 03/04 impacted the average — i.e., from +3¢ to +6¢ for corn, –2¢ to +2¢ for milo, and +16¢ to +26¢ for soybeans. Thus, even though these are relatively long-term averages, because of the high variability the results can change substantially simply by adding or deleting one or two years. Even though the 22-year average is positive for both corn and milo, these crops had negative returns to storage in 10 and 14 of the 22 years, respectively. Soybeans had a few less negative years than the feedgrains – 8 of 22 years.

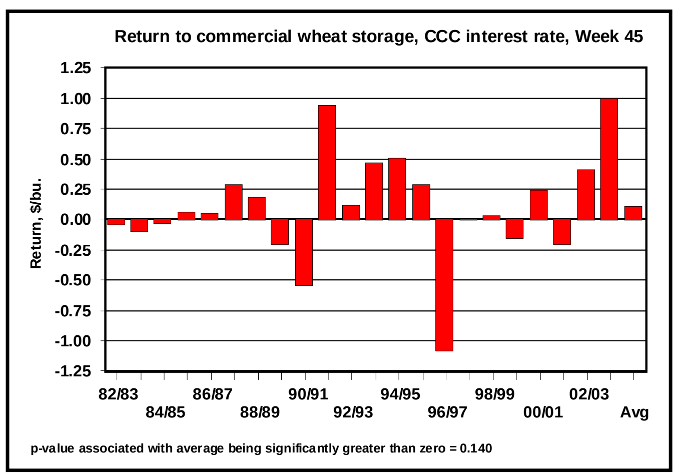

Figure 26

[4] The individual weeks were chosen to coincide with where returns were maximized in the case of wheat and soybeans and with the late spring/early summer time period for corn and milo (this time period is expected to be of more interest to producer than only storing 1-2 months).

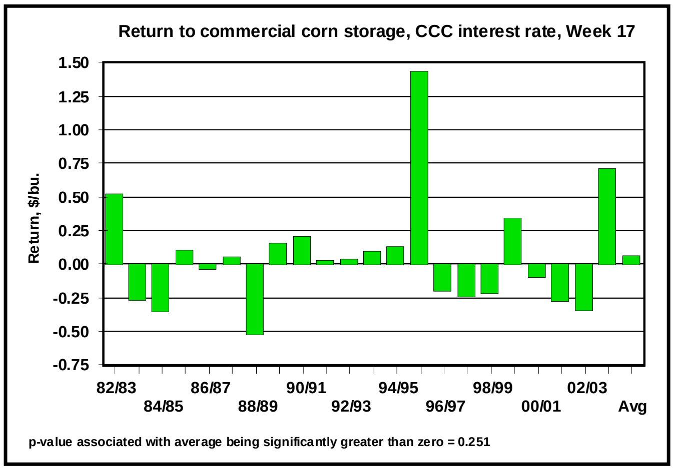

Figure 27

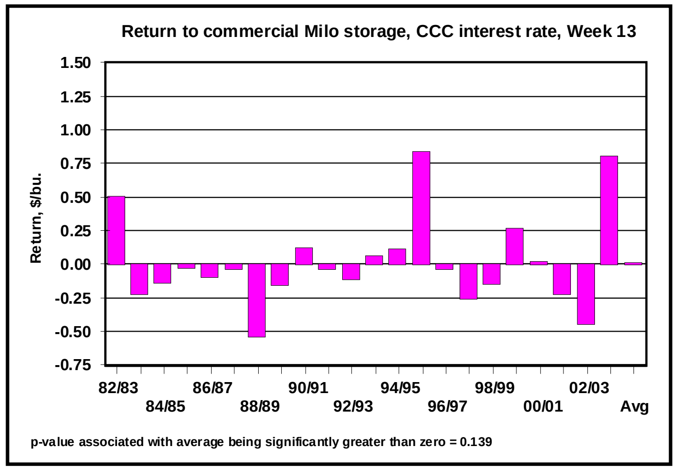

Figure 28

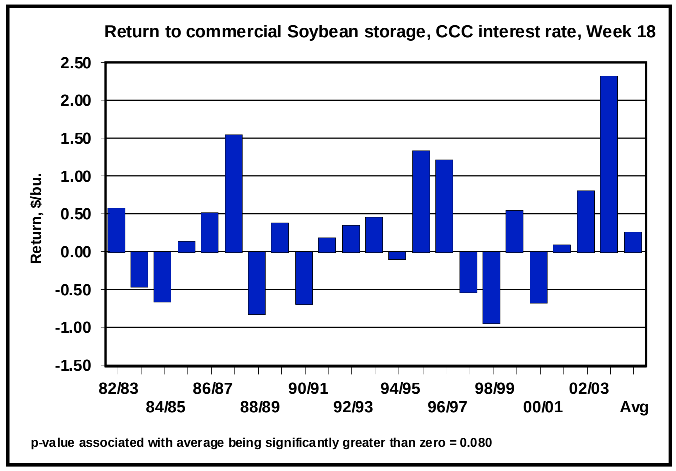

Figure 29

Based on the analysis of historical storage returns presented here, it appears that wheat and soybeans offer a little better potential to routinely storing the crop after harvest than the feedgrains. However, it is important to recognize that this analysis is based solely on cash prices as reported by elevators and it may be that feedgrain producers selling directly to livestock producers (i.e., feedyards) may capture a higher return to storage than what is depicted here. While the average returns to storage presented here are positive (with the exception of milo), the magnitudes of these returns are not large enough to cover the total cost of most on-farm storage systems. That is, the returns associated with seasonal price changes are not large enough, on average, to justify building grain bins. That does not imply that on-farm grain storage is not economical though, because producers often benefit in ways other than seasonal price movements (e.g., increased marketing flexibility, reduced harvest-time bottlenecks, reduced feed costs, identity preservation). The key point for producers to recognize from this analysis is that storing grain to take advantage of seasonal price movements essentially is an attempt to profit from a relatively efficient market, where routinely capturing returns that are significantly above costs is not very probable.

Seasonal Futures Prices

The previous sections discussing seasonal patterns of cash prices and returns to grain storage represent post-harvest marketing activities. It could be argued that these markets would be expected to be "more efficient" because most producers typically market their crops post harvest. That is, producers often are reluctant to market their crops prior to harvest and thus it may be that pre-harvest activities are less efficient and offer more profit potential. Another consideration pertaining to pre-harvest marketing alternatives is that a risk premium may exist in the market. That is, prices prior to harvest, hence marketing opportunities, are greater than at harvest (and post harvest) due to the uncertainty around the size of the upcoming crop. If a risk premium exists, we would expect that routinely marketing your crop (or a portion of it) would generate positive returns relative to simply selling at harvest.

One way to determine if a risk premium exists in the market is to calculate seasonal price indices for futures markets focusing on pre-harvest time periods of harvest contracts. To do this, monthly average futures prices were collected from 1973 through 2004 for harvest-time contracts for wheat (July), corn (Dec), and soybeans (Nov), beginning 11 months prior to the expiration month. Seasonal indices were calculated where the price in each month was divided by the price at expiration. Defined in this manner, months with a price index greater than 1.0 reflect opportunities to market prior to harvest (i.e., sell futures) for a higher price than at harvest (i.e., expiration month).

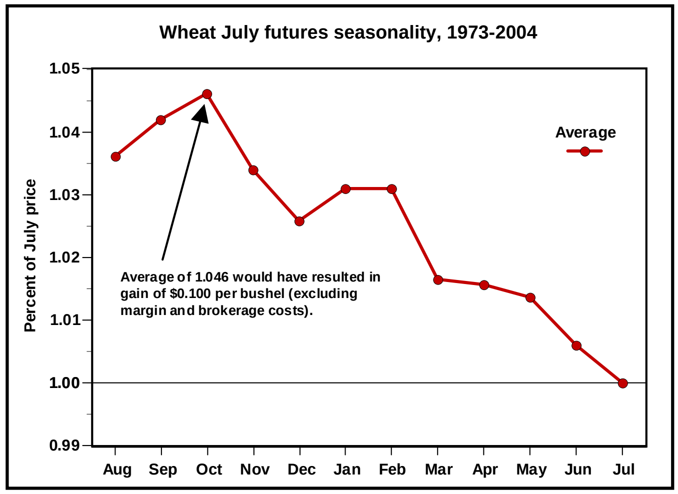

Figure 30

Figures 30-32 show the calculated futures price seasonal indices averaged over the last 32 years for wheat and the last 31 years for corn and soybeans, respectively. The indices for wheat are greater than 1.0 in all months prior to harvest suggesting the existence of a risk premium. The maximum average index value occurs in October (nine months prior to harvest) and is 1.046. This indicates that, if a producer routinely sold July futures in October and then bought back again in July, he would have sold futures at a price 4.6% higher than the purchase price. This difference equates to a 10.0¢ per bushel gain (excluding margin and brokerage costs). The monthly indices for corn follow a similar pattern as wheat in that the value for all months are greater than 1.0, suggesting the existence of a risk premium. The index value decreases as contract expiration (harvest) approaches, which is consistent with a risk premium (i.e., the uncertainty surrounding the size of the crop decreases the closer we get to harvest). The maximum average index value occurs in March (nine months prior to harvest) and is 1.065. This indicates that, if a producer routinely sold December futures in March and bought back again in December, he would have sold futures at a price 6.5% higher than it was purchased. This difference equates to a 10.3¢ per bushel gain (excluding margin and brokerage costs). The soybean monthly indices follow a slightly different pattern in that they actually peak in June (five months prior to expiration) and also are negative in October. That is, if a producer sold November futures in October and then bought back a month later, he actually would have been worse off. The index value in June, at 1.02, which would have equated to a gain of 3.2¢ per bushel, was considerably lower than with wheat and corn.

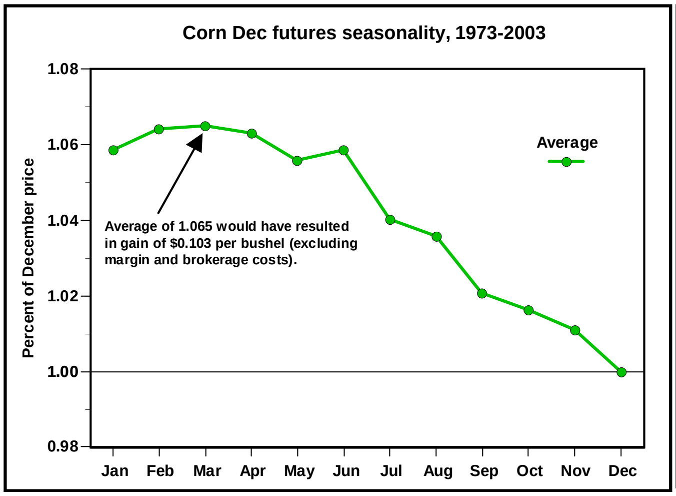

Figure 31

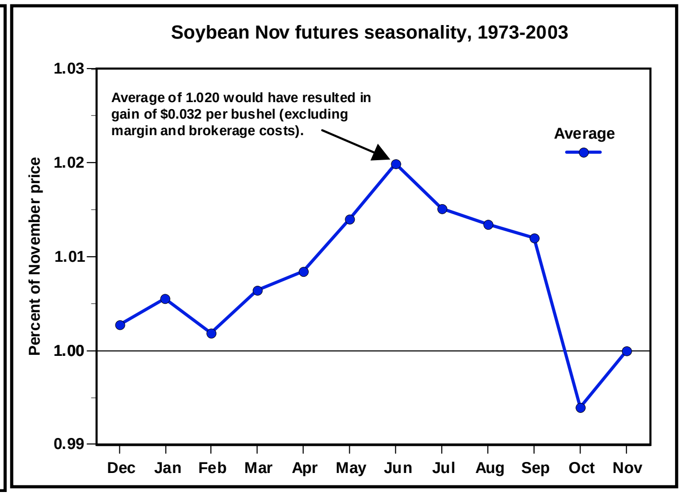

Figure 32

As was the case with returns to market advisory services or grain storage, it is important to examine the risk (variability) associated with these strategies as well as the expected values (averages). Figures 33-35 show the annual gain to selling futures according to what is best on average — i.e., selling wheat in October, corn in March, and soybeans in June. The average gain from routinely selling July wheat futures in October was 10.0¢ per bushel, but this gain ranged from a high of +$1.48 in 1975 to a loss of $1.18 per bushel in 1995. Furthermore, 41% of the time the returns were negative (i.e., prices increased from October to July). The gains to routinely selling December corn futures in March averaged 10.3¢ per bushel and ranged from a high of +$1.13 in 1981 to a low of –$1.16 per bushel in 1973. A producer routinely selling December futures in March would have realized a loss on this strategy 39% of the time (i.e., 12 of 31 years prices increased rather than decreased from March to December). Routinely selling November soybean futures in the month of June would have resulted in a gain of only 3.2¢ per bushel, but over two-thirds of the time this strategy would have been profitable, with six years the gains being in excess of $1/bu (max of +$1.60/bu in 1988). On the other hand, 10 years out of 31 (32% of the time), this pre-harvest strategy would have resulted in a loss, with four of those 10 years the loss being $2/bu or more (max of –$2.55/bu in 1974).

Another way to examine pre-harvest pricing opportunities is to identify not only which selling month tended to be most profitable, but also how frequently that month was most profitable, as well as a comparison with other candidate selling month. That is, while October, March, and June were the optimal months to pre-price wheat, corn, and soybeans, respectively, on average, it is useful to also know how often these months were optimal. Figure 36 shows the number of times the different months were optimal for selling (and then buying back in the expiration month) for wheat, corn, and soybeans. Several features stick out from this figure. First, no month dominates in terms of being optimal for any of the crops. The most consistent month is August for wheat (7 of 32 years, 22%). Also, nearly every month has been optimal for all crops at least once (the exceptions are March and June for wheat and February for soybeans). It can also be seen that 5, 5, and 3 of the years the optimal month was the expiration month for wheat (July), soybeans (November), and corn (December), respectively. Thus, in these years, the optimal pre-harvest pricing strategy was to do nothing since harvest prices were highest.

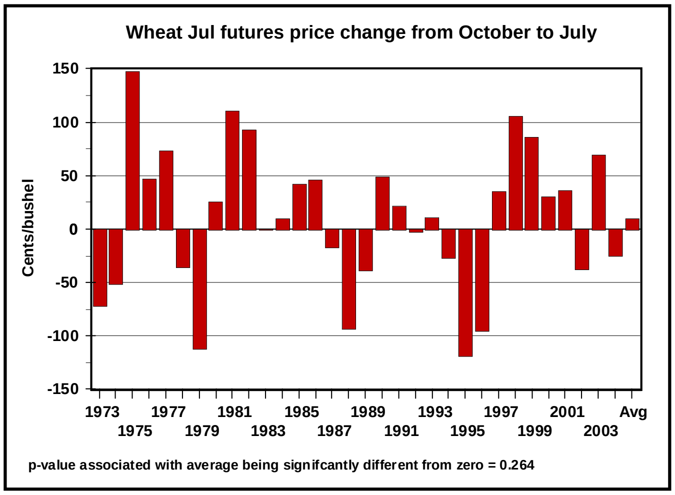

Figure 33

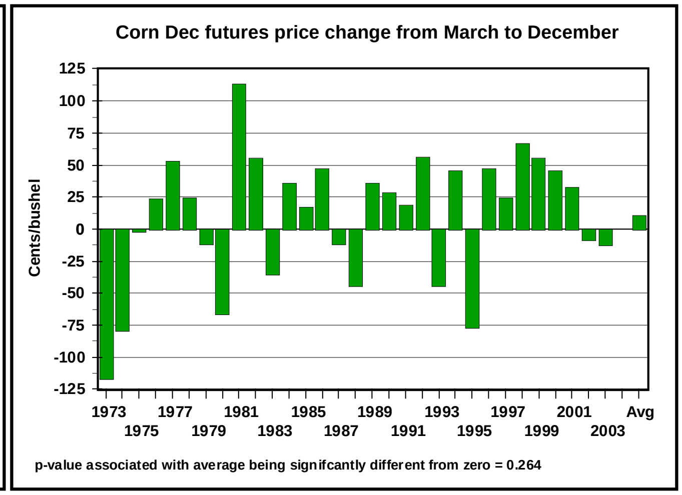

Figure 34

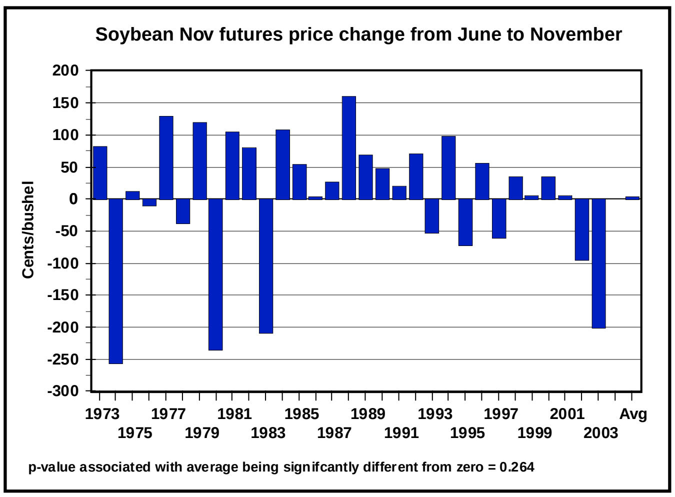

Figure 35

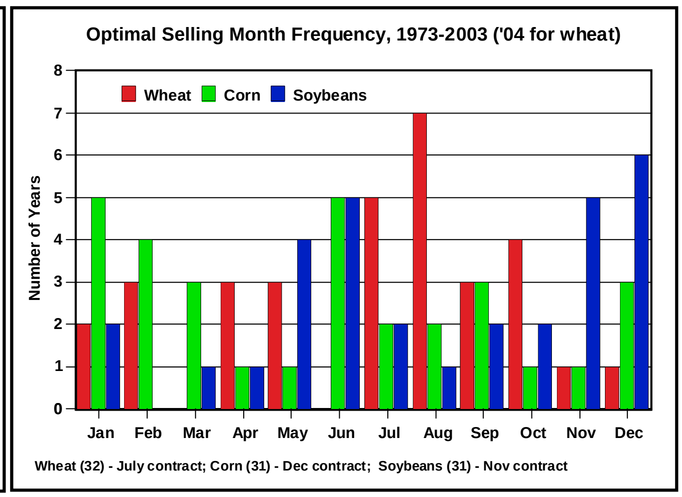

Figure 36

This analysis of the seasonality of futures price prior to harvest suggests that a risk premium indeed does exist in the markets. However, being able to routinely capture this risk premium in real-time is extremely difficult because of the extreme year-to-year variability in the seasonal price patterns. The variability that makes it hard to capture the risk premium is twofold – first is the fact that price changes (increase versus decrease) are highly variable from year to year and the second is the fact that timing (optimal month) varies considerably from year to year.

Basis and Marketing Decisions

In figure 1 basis is listed towards the top half of the list indicating that it is similar to storage returns and seasonal prices with regards to efficiency. That suggests that profiting from basis information may be difficult. But, basis also is related to selecting which market to be in (futures or cash) and it also is related to a specific cash price location. Thus, it may be that knowing basis and understanding how it relates to the various marketing activities/strategies may allow a producer to consistently capture small returns (i.e., there may be some basis-related market inefficiencies). Basis information is used to help evaluate cash and forward contract bids, making storage decisions, deciding when to lift hedges, projecting cash prices, and picking between various marketing strategies.

Basis is defined as the difference between a specific cash price and a specific futures price (e.g., wheat cash price in Hutchinson Kansas minus KCBT July wheat futures). Basis can be either calculated with the nearby futures contract (i.e., the contract closest to expiration) or using a deferred futures contract. While some people track deferred basis levels to examine potential storage returns, the only basis that is needed to make marketing decisions is nearby basis. Different people use slightly different rules for defining the nearby futures contract, hence nearby basis. Here the nearby futures contract is defined as the contract closest to expiration without going into the delivery month. Thus, the nearby basis in the month of July is calculated as the cash price minus the September futures contract price (since KCBT does not trade August wheat). Figures 37-40 give a visual representation of the nearby basis for wheat, corn, grain sorghum (milo), and soybeans, respectively, on July 21, 2004 for Kansas and the surrounding states. Milo basis is the difference between the milo cash price and the Chicago Board of Trade (CBT) corn futures price.

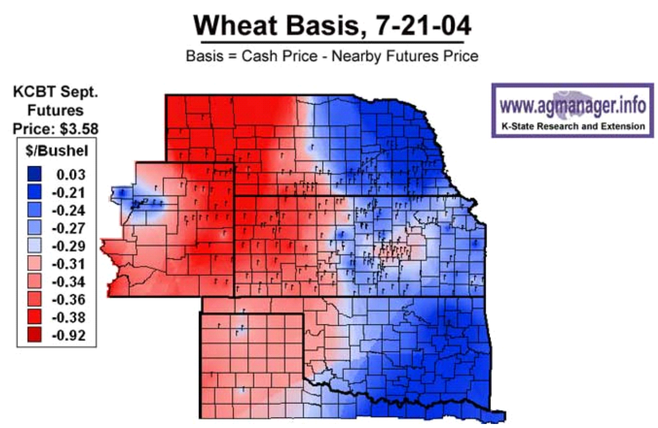

Figure 37

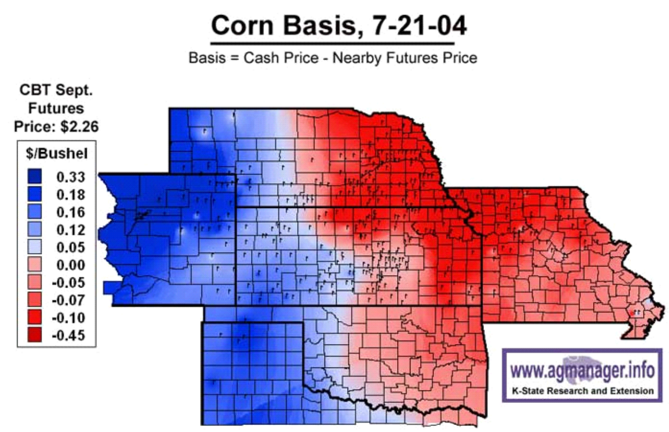

Figure 38

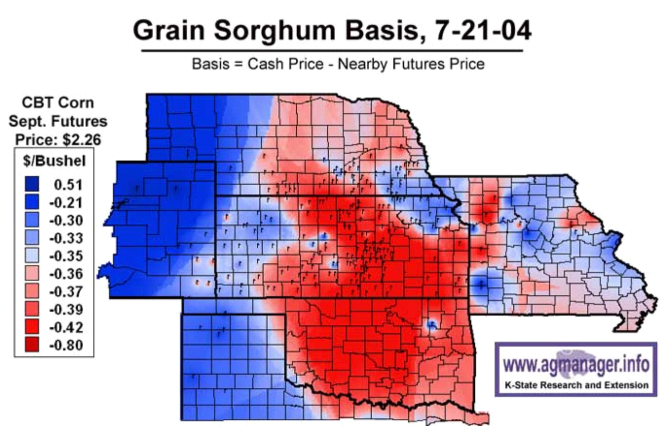

Figure 39

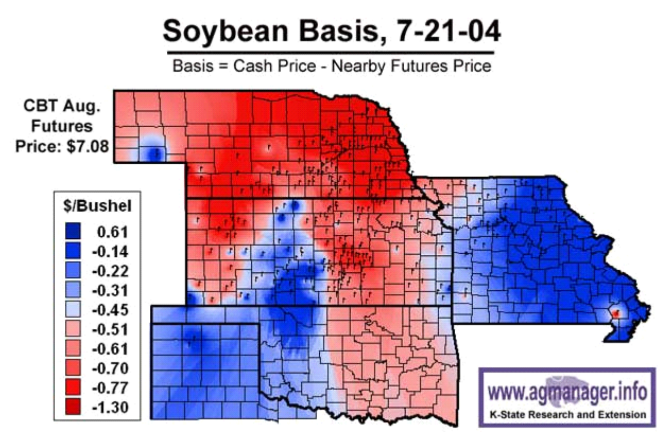

Figure 40

The basis maps depicted as figures 37-40 are updated on a monthly basis on the third Wednesday of the month and can be found online at www.agmanager.info/crops/marketing/. Because the basis for all the locations is calculated using the same futures price, these maps reveal relative differences in cash prices geographically. For example, wheat basis is stronger (i.e., less negative) in eastern Kansas than in western Kansas, indicating higher wheat prices in eastern Kansas. Comparing the corn and milo basis maps reveals that corn prices in western Kansas are stronger than eastern Kansas, which is what would be expected due to feedlots being more prevalent in western Kansas. Milo basis follows a similar pattern except that there is a pocket in northeast Kansas where milo basis is similar to western Kansas.

While having information such as that depicted in figures 37-40 is interesting and can help producers get a broad view of markets geographically, it is not particularly useful for making specific marketing decisions. In order for basis to be most useful for making marketing decisions, producers need basis forecasts (i.e., an expectation as to what basis will be sometime in the future or what it currently is compared to what it is expected to be). The reason for this has to do with the definition of basis, which is

(1) basis = cash price – futures price,

which can be rearranged to the following

(2) cash price = futures price + basis.

Given that a futures price is a forecasted price (remember from earlier discussion that futures forecasts are generally more accurate than USDA or Extension economists), that implies that we can forecast cash prices if we have a forecast of basis. That is, the following relationship holds for forecasting cash prices

(3) expected cash price = futures price + expected basis.

Equation (3) is only useful if we can predict or forecast basis with a reasonable amount of accuracy. It is generally accepted that basis is easier to predict than prices in absolute levels (i.e., $/bu). This is because basis levels generally are capped at the cost of transportation between cash price location and futures contract delivery point, at least at contract expiration, and also because the two prices tend to move together as the same fundamental conditions generally affect both markets. Thus, while price levels vary considerably from year to year due to supply and demand conditions, the difference between futures prices and cash prices (i.e., basis) tends to be more stable. The important implication of this year-to-year stability in basis is that historical basis levels often are a relatively good indicator of future basis levels and thus a historical average is a reasonable forecast. Research generally has shown that there is little benefit to complex models compared to historical averages. This is because estimated models become dated and because information required in the models (e.g., exports, production) often have to be forecasted as well. The key point is that basis forecasts are important for making management and marketing decisions and these forecasts are often simple historical averages. While the number of years included in the historical averages varies (often depending on data availability), 3- to 5-year averages likely are the most common selections.

Figures 41-44 visually display how basis on July 21, 2004 compared to the 3-year historical average for that same week (i.e., the deviation in current basis from expected basis) for wheat, corn, milo, and soybeans, respectively.

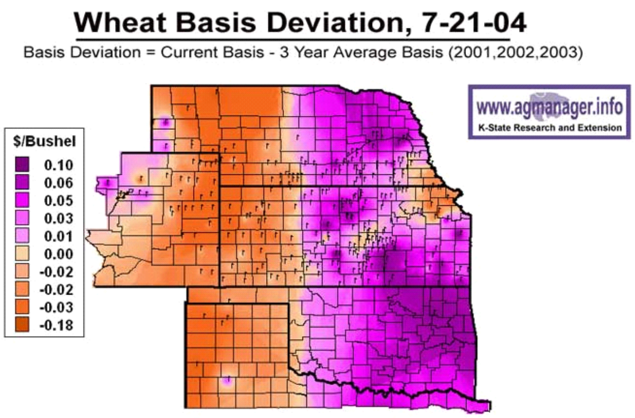

Figure 41

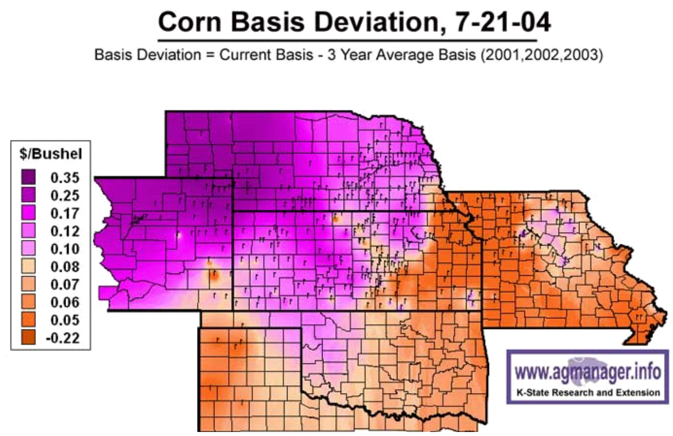

Figure 42

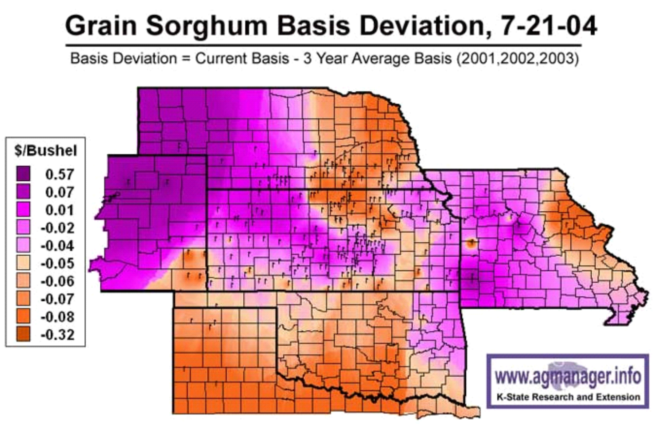

Figure 43

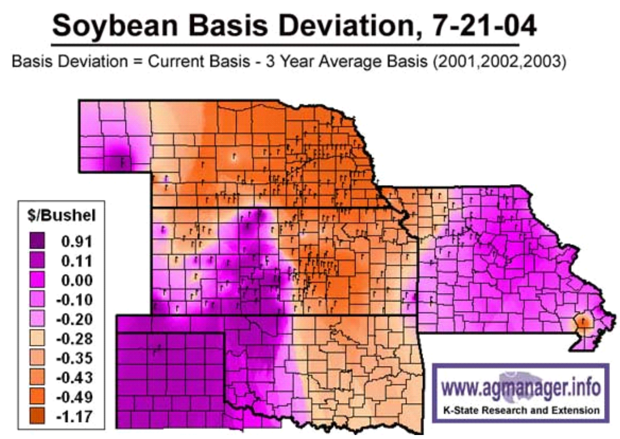

Figure 44

The data mapped in figures 41-44 is the difference between the current (7-21-04) basis and the average from the preceding three years. Thus, this deviation can be viewed as a "forecast error" given that the 3-year historical average represents how basis is typically forecasted. So what is the interpretation of this forecast error? For wheat (figure 41), the deviation ranges from +6¢ to –3¢ for the most part, with the positive values being in the eastern half of the region and the negative values in the western half. This suggests that basis in 2004 was quite similar to the previous three years (i.e., the forecast error was relatively low) and that basis was a little stronger than expected in eastern Kansas but a little weaker than expected in western Kansas. Corn basis (figure 42) was stronger than expected across most of the region and relatively strongest in the west. The deviation in corn basis (i.e., forecast error) is somewhat larger than it was for wheat. Milo basis (figure 43) typically is expected to follow a similar pattern as corn, but it can be seen that it has a region in north central Kansas where it is relatively week compared to the 3-year average and the rest of the state. The soybean basis deviations (figure 44) reflect the most variability as some regions are considerably stronger than normal while others are considerably weaker than expected. However, it is important to recognize that, given the time of the year reflected in this map (late July), there may be very little soybean cash market "activity" and thus basis levels are not particularly relevant (i.e., basis matters little if few soybeans are being sold).

Incorporating Current Information Into Basis Forecasts

While it is true that basis levels often are much easier to predict than price levels, figures 41-44 reveal that forecasting basis with simply averages can result in large forecast errors at times (i.e., forecasts are inaccurate). However, as previously mentioned, developing complex econometric models for forecasting basis is not necessarily the answer for two reasons. First, they often are not much more accurate, and second, if they are too complex nobody will use them anyway. Thus, a question arises, Can historical-average forecasts be improved upon in a manner that increases accuracy but retains ease of calculation? A weakness of using historical averages as a forecast is that they completely ignore current market conditions. For example, if I need a forecast of corn basis for 3-4 months from today and I know that today's basis is relatively strong, should I incorporate that information into my basis forecast? Intuitively, it seems to make sense that it might be advantageous to "adjust" historical-average forecasts based on current market conditions.

A study was conducted to compare the basis forecast errors from two types of forecasts: (1) a simple multiple-year average and (2) a multiple-year average adjusted by current information, where current information is defined as basis deviation from historical average (Taylor, Dhuyvetter, and Kastens — TDK). Without going into all the details, the study basically looked at forecasting basis for wheat, corn, milo, and soybeans in Kansas (averaged across six locations) for two time periods, harvest and 24 weeks post-harvest (harvest+24). When basis forecasts include current information, another important factor to consider is the time horizon of the forecast. That is, *when* the forecast is being made is relevant. This is not an issue when forecasts are made using simple historical averages as they don't change from week to week. For example, the 3-year historical average wheat basis in early July is the same in January as it is in March. However, if I am adjusting that 3-year average based on current market conditions, my forecast in January and March can differ. Thus, the TDK study consider forecasting time horizons of 4, 8, 12, 16, 20, 24, 28, and 32 weeks prior to harvest for the harvest-time basis forecast and time horizons of 4, 8, 12, 16, and 20 weeks prior to the harvest+24 basis forecast.[5]

Another aspect of the study was to examine multiple-year averages to determine the optimal number of years to use in an historical average. In an earlier study of Kansas basis, it was determined that the optimal number of years to use in a historical average was 4 years for wheat and 5-7 years for corn, milo, and soybeans (Dhuyvetter and Kastens). The TDK study included an additional five years of data and considered fewer locations and weeks, but it was found that the number of years was not particularly important. For example, TDK found that the basis forecast error was similar whether a 2-, 3-, 4- or 5-year average was used. Additionally, TDK found that the average forecast error with the additional five years of data was considerably higher, suggesting that basis in Kansas has been getting

[5] Cash price data are defined to have 48 weeks per year (4 weeks/month). Thus, this study looked at forecasting harvest-time basis beginning eight months prior to harvest (in one month increments) and also forecasting basis six months after harvest where the forecasts begin at harvest and continue in one month increments for the next five months.

harder to forecast accurately in recent years. This result (i.e., basis getting more difficult to predict) lends support to the importance of looking at alternative methods of forecasting basis, such as incorporating new information.

The following is the model TDK used to forecast basis

(4) $\text{basis forecast}_t = \text{historical average}_t + \mathbf{8}(\text{current basis}_{t\text{-}j} – \text{historical average}_{t\text{-}j})$,

where subscript “t” refers to the time period being forecasted (i.e., harvest and harvest+24), the subscript “t-j” represents the time horizon of when the forecast is made (i.e., 1-8 months prior to harvest and 1-5 months prior to harvest+24), and **8** represents the “amount” of the current deviation to include in the adjustment and is some value between 0 and 1. In words, equation (4) simply says that the basis forecast for some time period (e.g., harvest) is equal to the historical average for that time period plus an adjustment that accounts for whether today’s basis is stronger than normal or weaker than normal. For example, if **8** = 0.80 and the current basis is 10¢ stronger than expected, we would adjust the historical average by +8¢. Likewise, if the current basis were 5¢ weaker than expected (i.e., current basis is less than historical average), we would adjust the historical average by –4¢. The value for **8** was “solved for” using an out-of-sample procedure that minimized the sum of squared forecast errors across all locations and years. However, **8** was allowed to vary by time horizon because it was assumed that the “optimal” amount of current information to include in a forecast would depend on when the forecast was made. Specifically, it was assumed that **8** would be greater for shorter time horizons (i.e., current information is more useful to include when the time period being forecasted is not too far away).

The results of the out-of-sample basis forecast accuracy are presented in figures 45-48 for wheat, corn, milo, and soybeans, respectively. Forecast accuracy is measured in terms of mean absolute error (MAE) in cents per bushel. Thus a MAE of 15¢ implies that the average forecast error (plus or minus) was 15¢ per bushel. Forecast accuracy is reported for both the models incorporating current information (blue bars) and the forecast based on the historical average (2-year for corn and milo and 3-year for wheat and soybeans) (red line). By definition, the forecast including current information can never be worse than the simple average because when **8** = 0 the two forecasts are equal. Thus, the MAEs of the two forecasts will be similar when current market conditions provide little useful information. It can be seen that prior to harvest (i.e., Pre-Harvest), the MAEs of the two models are similar for wheat and soybeans. For the corn and milo basis forecasts the models including current information had slightly lower MAEs than the simple average suggesting it may be beneficial to account for current market conditions in these markets. For the harvest+24 time period (Post-Harvest), including current information in basis forecasts significantly reduced the forecast error for all crops except soybeans. Intuitively, it makes sense that current information would be more useful in post-harvest forecasts (compared to pre-harvest forecasts) because once the size of the crop is known it should be useful to incorporate this information into basis forecasts for later in the crop year.

The optimal **8** for corn and milo for harvest-time basis forecasts ranged from 0.4 to 0.8, depending on the time horizon. The optimal **8** for wheat, corn, and milo post-harvest (i.e., harvest+24 time period) ranged from 0.6 to almost 1.0, depending on the time horizon. Optimal **8**s by crop and time horizon are not reported here to save space, but are available from the authors upon request. From a practical standpoint, using a constant **8** of 0.8 for post-harvest basis forecasting is recommended. That is, when forecasting basis post-harvest, producers should use a historical average and adjust it by adding 80% of the deviation in current basis from its historical average.

Basis Forecast Accuracy for Wheat

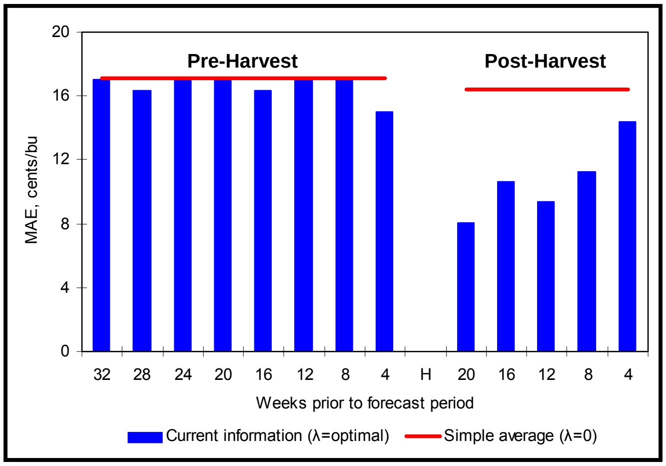

Figure 45

Basis Forecast Accuracy for Corn

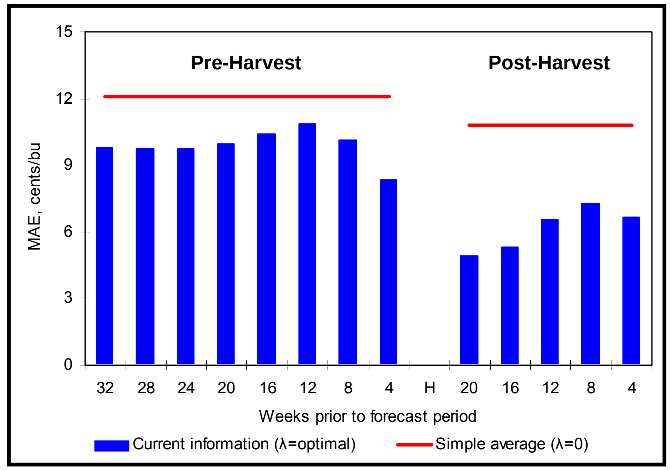

Figure 46

Basis Forecast Accuracy for Milo

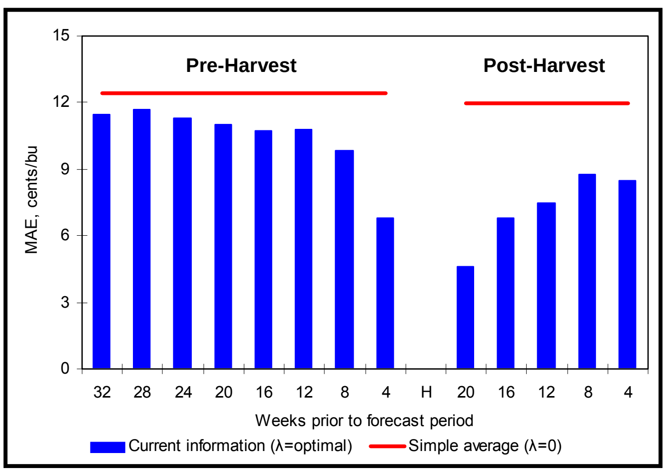

Figure 47

Basis Forecast Accuracy for Soybeans

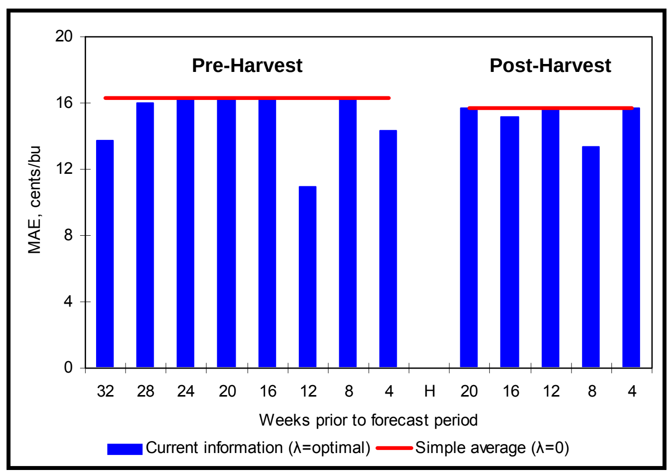

Figure 48

The information presented in figures 45-48 suggests that incorporating current information into post-harvest basis forecasts offers potential to improve forecast accuracy. However, this method of incorporating current information does not appear to be particularly useful for predicting harvest-time basis prior to harvest. Another possible way to forecast harvest-time basis that incorporates current information would be to simply consider the basis that is implied by forward contract bids. That is, when grain buyers offer a forward contract they are implicitly quoting a basis. This implicit basis quote can be used as a forecast of what basis will actually be at harvest time. Data from forward contracts for various locations across Kansas from 2000-2003 were used to calculate an implied basis and the corresponding MAE (i.e., forecast accuracy). Figure 49 shows the MAEs when harvest-time basis is forecasted with a simple average (3-year), a historical average incorporating current information, and a forward-contract-implied basis forecast. While the time periods do not match up exactly due to data availability, the MAEs reflect four years of basis forecasts in all cases and thus they should be roughly comparable. Based on this analysis, it appears that forecasting basis using the information contained in a forward contract bid is more accurate than a simple average or a simple average adjusted with current information. A potential problem with this method is that it may not be available for time periods five or more months in advance of harvest. Also, it is not known at this time if this same result will hold for other crops (we hope to conduct a similar analysis for corn in the near future). For related information pertaining to the forward contracting data used here see *Hedging vs. Forward Contracting for Wheat* (Taylor, Dhuyvetter, and Kastens).

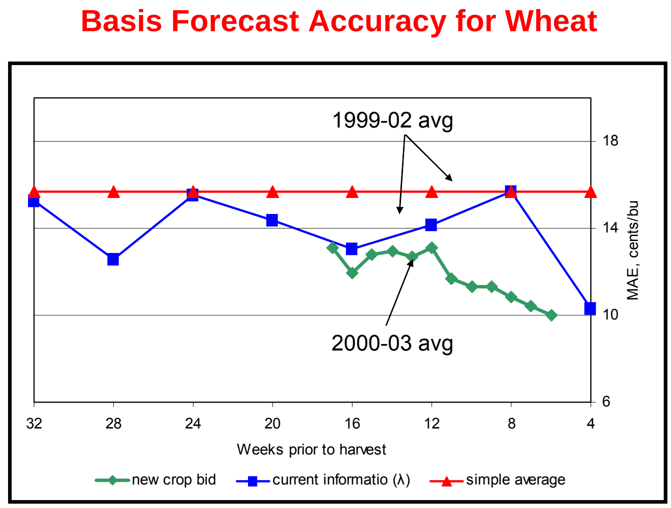

Figure 49

Summary and Conclusions

This paper has presented a lot of data and covered numerous marketing-related topics and there has been one point that has been fairly consistent throughout the topics — grain marketing is not easy! That is, while many people like to talk about the importance of marketing, it is very difficult to find evidence of people (producers or marketing advisors) that can identify marketing strategies that consistently make them money. Does this mean that marketing is not important and that producers should not spend management time in this area? Obviously marketing is important because if you produce a crop you have to market it. However, the data presented here (as well as much of what pervades the agricultural economics literature) is that markets are quite efficient and thus spending management time trying to "beat the market" is probably not a good use of time. However, if management time is spent identifying the right markets to be in and making the right "small" decisions (i.e., picking up a nickel here and there), this is probably a good use of management time. Producers should focus their management time in the areas where they can make a difference and where they have some control. As a general rule, picking prices (or marketing strategies) typically is not one of these areas.

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