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DISCLAIMER

The advisory service marketing recommendations used in this research represent the best efforts of the AgMAS Project staff to accurately and fairly interpret the information made available by each advisory program. In cases where a recommendation is vague or unclear, some judgment is exercised as to whether or not to include that particular recommendation or how to implement the recommendation. Given that some recommendations are subject to interpretation, the possibility is acknowledged that the AgMAS track record of recommendations for a given program may differ from that stated by the advisory service, or from that recorded by another subscriber. In addition, the net advisory prices presented in this report may differ substantially from those computed by an advisory service or another subscriber due to differences in simulation assumptions, particularly with respect to the geographic location of production, cash and forward contract prices, expected and actual yields, carrying charges and government programs.

The 1995 Through 1998 Pricing Performance of Market Advisory Services for Wheat

Executive Summary

The primary purpose of this research report is to present an evaluation of advisory service pricing performance for the 1995, 1996, 1997, and 1998 wheat crops. In order to evaluate the returns to the marketing advice produced by the services, the AgMAS Project purchases a subscription to each of the services included in the study. The information is received electronically via DTN, World Wide Web sites or e-mail. Staff members of the AgMAS Project read the information provided by each advisory service on a daily basis. A directory of the advisory services included in the study can be found at the **Agricultural Market Advisory Services (AgMAS) Project website** (<http://web.aces.uiuc.edu/farm.doc/agmas/>).

Certain explicit assumptions are made to produce a consistent and comparable set of results across the different advisory programs. These assumptions are intended to accurately depict “real-world” marketing conditions. Several key assumptions are: i) with a few exceptions, the marketing window for wheat is June 1st of the year prior to harvest to May 31st of the year following harvest, ii) cash prices and yields refer to a soft red winter wheat producer in southwest Illinois, iii) all storage is assumed to occur off-farm at commercial sites, and iv) loan deficiency payment (LDP) recommendations made by advisory programs are followed wherever feasible and applicable.

The average net advisory price across all 24 wheat programs in 1995 is \$3.79 per bushel, \$0.18 above the market benchmark price. The range in 1995 is \$3.01 to \$4.71 per bushel. The average net advisory service price for 23 wheat programs in 1996 is \$3.82 per bushel, \$0.13 below the market benchmark. The range in 1996 is \$2.74 to \$4.94 per bushel. The average net advisory price for all 20 wheat programs in 1997 is \$2.64 per bushel, \$0.58 below the market benchmark. The range in 1997 is \$1.34 to \$3.90 per bushel. Finally, the average net advisory price across all 21 services in 1998 is \$2.36 per bushel, \$0.54 below the market benchmark. The range in 1998 is \$1.34 to \$3.33 per bushel.

The average revenue achieved by following the wheat programs over four years is \$151 per acre, \$16 less than the four-year average market benchmark revenue. The spread in advisory revenue also is noteworthy, with the difference between the bottom- and top-performing advisory programs over four years reaching nearly \$40 per acre.

An advisory program’s net price or revenue received is an important indicator of performance. However, the tradeoff between pricing performance and risk is likely to be of interest to producers. Based on the data available for 1995-1998, a modestly negative tradeoff between average net advisory price and risk is found; producing higher net prices generally requires that an advisory program take on less risk, and *vice versa*. One advisory program in wheat outperforms the market benchmark when both price and risk are considered, while many have a lower price and higher risk. No program outperforms the benchmark based on revenue. It is important to emphasize that the pricing and risk performance results are based on only four observations. This is a small sample for estimating the true risks of market advisory programs. Hence, the return-risk results should be viewed as exploratory rather than definitive.

Introduction to the AgMAS Project

Wheat producers operate in a highly uncertain economic environment. The roller coaster movement of wheat prices since 1995 is ample evidence of the uncertainty and risk facing wheat producers. In this rapidly changing environment, marketing and risk management play an important role in the overall management of farm businesses. The use of private-sector advisory services has increased over time as producer demand for marketing and risk management advice has increased. Surveys document the high value that many producers place on market advisory services.¹

Despite their current popularity and expected importance in the future, surprisingly little is known about the marketing and risk management strategies recommended by these services and their associated performance. There is a clear need to develop an ongoing “track record” of the performance of these services. Information on the performance of advisory services will assist producers in identifying successful alternatives for marketing and price risk management.

The **Agricultural Market Advisory Services (AgMAS)** Project, initiated in the fall of 1994, addresses the need for information on advisory services. Dr. Darrel L. Good and Dr. Scott H. Irwin of the University of Illinois at Urbana-Champaign jointly direct the project. Correspondence with the AgMAS Project should be directed to: Joao Martines-Filho, AgMAS Project Manager, 434a Mumford Hall, 1301 West Gregory Drive, University of Illinois at Urbana-Champaign, Urbana, IL 61801; voice: (217)333-2792; fax: (217)333-5538; e-mail: agmas@uiuc.edu. The AgMAS project also has a website with the following address: <http://web.aces.uiuc.edu/farm.doc/agmas/>.

Funding for the AgMAS Project is provided by the following organizations: American Farm Bureau Foundation for Agriculture; Illinois Council on Food and Agricultural Research; Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture; Economic Research Service, U.S. Department of Agriculture; and the Risk Management Agency, U.S. Department of Agriculture.

¹ Patrick, G.F. and S. Ullerich. “Information Sources and Risk Attitudes of Large Scale Farmers, Farm Managers, and Agricultural Bankers.” *Agribusiness*. 12(1996):461-471.

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Norvell, J. M. and D. H. Lattz. “Value-Added Crops, GPS Technology and Consultant Survey: Summary of a 1998 Survey to Illinois Farmers.” Working Paper, College of Agricultural, Consumer, and Environmental Sciences, University of Illinois, July 1999.

Purpose of Report

The primary purpose of this research report is to present an evaluation of advisory service pricing performance for the 1995, 1996, 1997, and 1998 wheat crops. Specifically, the net advisory price received by a subscriber to an advisory service is calculated for wheat harvested in each of these years. With some exceptions, the marketing window for each year is from June 1st of the year prior to harvest through May 31st of the year following harvest. The most important exceptions are due to two services that still held all of the 1997 and/or 1998 wheat crops at the time the analysis was conducted for this report. In order to complete the analysis for these two services, futures positions and all remaining cash amounts are marked-to-the-market as of May 31, 2000. Future AgMAS wheat pricing reports will update and revise results for these two services when they make final pricing decisions.

An important point to consider is that the pricing results are available for only four marketing periods. *It is inappropriate to draw too many conclusions from four crop years' results.* A useful analogy is university yield trials for crop varieties. In evaluating the results of crop yield trials, while the results of the most recent year may be of particular interest, firm conclusions about the relative merits of one variety versus another can only be drawn after a number of years of results are available. The same is true for market advisory services.

It is also important to recognize that the performance results in this report emphasize the pricing, or return, element of marketing and risk management. While certainly useful, such results do not address the issue of risk. Two advisory services with the same average net price, for example, may expose producers to quite different risks. The final section of this report contains a “first look” at the relationship between the wheat pricing performance and risk of advisory services. Since the return-risk results are based on just four years of data, the results must be viewed quite cautiously.

This report has been reviewed by the AgMAS Review Panel, which provides independent, peer-review of AgMAS Project research. The members of this panel are: Frank Buerskens, Director of Product Strategy for e-markets; Renny Ehler, producer in Champaign County, Illinois; Chris Hurt, Professor in the Department of Agricultural Economics at Purdue University; Terry Kastens, Assistant Professor in the Department of Agricultural Economics at Kansas State University and producer in Rawlins County, Kansas; and Robert Wisner, University Professor in the Department of Economics at Iowa State University.

The next section of the report describes the procedures used to collect the data on wheat market advisory service recommendations. The second section of this report describes the methods and assumptions used to calculate the returns to marketing advice. The third section presents the year-by-year overview of 1995, 1996, 1997, and 1998 pricing results for wheat. The fourth section presents a summary of the combined results for the 1995, 1996, 1997, and 1998 crop years. The final section presents initial results on the tradeoff between pricing performance and risk of market advisory services in wheat.

Data Collection

The market advisory services included in this evaluation do not comprise the full population of market advisory services available to wheat producers. The included services also are not a random sample of the population of market advisory services. Neither approach is feasible because no public agency or trade group assembles a list of advisory services that could be considered the "population." Furthermore, there is not a generally agreed upon definition of an agricultural market advisory service. To assemble the sample of services for the AgMAS Project, criteria were developed to define an agricultural market advisory service and a list of services was assembled.

The first criterion used to identify services is that a service has to provide marketing advice to producers. Some of the services tracked by the AgMAS Project do provide speculative trading advice, but that advice must be clearly differentiated from marketing advice to producers for the service to be included. The terms "speculative" trading of futures and options versus the use of futures and options for "hedging" purposes are used for identification purposes only. A discussion of what types of futures and options trading activities constitute hedging, as opposed to speculating, is not considered.

The second criterion is that specific advice must be given for making cash sales of the commodity, in addition to any futures or options hedging activities. In fact, some marketing programs evaluated by the AgMAS Project do not make any futures and options recommendations. However, marketing programs that make futures and options hedging recommendations, but fail to clearly state when cash sales should be made, or the amount to be sold, are not considered.

A third, and fairly obvious, criterion is that the advice must be transmitted to subscribers before the action is to be taken. This is largely the reason that only electronically delivered services are evaluated.

The original sample of market advisory services that met the three criteria was drawn from the list of "Premium Services" available from the two major agricultural satellite networks, Data Transmission Network (DTN) and FarmDayta, in the summer of 1994.^{2,3} While the list of advisory services available from these networks was by no means exhaustive, it did have the considerable merit of meeting a market test. Presumably, the services offered by the networks were those most in demand by farm subscribers to the networks. In addition, the list of available services was crosschecked with other farm publications to confirm that widely followed advisory firms were included in the sample. It seems reasonable to argue that the resulting sample of

² When the AgMAS study began in 1994, DTN and FarmDayta were separate companies. The two companies merged in 1996.

³ This requirement has been relaxed in recent years to reflect the growing importance of alternative means of electronic delivery of market advisory services. Beginning in 1997, a service that meets the original two criteria and is available on a "real-time" basis electronically may be included in the sample.

services was (and remains) generally representative of the majority of advisory services available to producers.

The total number of advisory programs evaluated for at least one of the four marketing years is 27, of which 18 are followed for all four years. The term “advisory program” is used because several advisory services have more than one distinct marketing program. Ag Line by Doane, Agri-Edge, Brock Associates, Pro Farmer, and Stewart-Peterson Advisory Services each have two distinct marketing programs, and Agri-Visor has four distinct marketing programs.

For a variety of reasons, additions and deletions to the sample of wheat advisory programs has occurred over time. Progressive Ag is included in the study for the 1996, 1997, and 1998 marketing years, but was not included in 1995 because it had not yet come to the project’s attention. Utterback Marketing Services is included in 1997 and 1998, but was not included in 1995 or 1996 because its marketing programs were not deemed to be clear enough to be followed by the AgMAS Project. Grain Field Report, Harris Weather/Elliot Advisory, North American Ag and Prosperous Farmer were in the study in 1995 and/or 1996, but are not included in 1997 or 1998 because they no longer provide specific recommendations regarding cash sales. Agri-Edge was included in 1995 and 1996, but the service was discontinued during the 1997 crop year. Ag Line by Doane hedge program for wheat was introduced for the 1998 crop year. In addition, Agri-Mark, which is included in corn and soybean evaluations, is not included in the wheat evaluation because their recommendations are not directed towards a soft red winter wheat producer.

Two forms of sample selection biases may be potential problems when assembling an advisory program database. The first form is survival bias, which occurs if only advisory programs that remain in business at the *end* of a given period are included in the sample. Survival bias significantly biases measures of performance upwards since “survivors” typically have higher performance than “non-survivors.”⁴ This form of bias should not be present in the AgMAS database of advisory programs because all programs ever tracked are included in the sample. The second and subtler form of bias is hindsight bias, which occurs if data from prior periods are “back-filled” at the point in time when an advisory program is added to the database. Statistically, this has the same effect as survivorship bias because data from surviving advisory programs are back-filled. This form of bias should not be present in the AgMAS database because recommendations are not back-filled when an advisory program is added. Instead, recommendations are collected only for the marketing period *after* a decision has been made to add an advisory program to the database.

The actual daily process of collecting recommendations for the sample of advisory programs begins with the purchase of subscriptions to each of the programs. Staff members of the AgMAS Project read the information provided by each advisory program on a daily basis. The information is received electronically, via DTN, websites or e-mail. For the programs that provide two daily updates, typically in the morning and at noon, information is read in the

⁴ Brown, S. J., W. Goetzmann, R.G. Ibbotson, and S.A. Ross. “Survivorship Bias in Performance Studies.” *Review of Financial Studies*. 5(1992):553-580.

morning and afternoon. In this way, the actions of a producer-subscriber are simulated in “real-time.”

The recommendations of each advisory program are recorded separately. As noted above, some advisory services offer two or more distinct marketing programs. This typically takes the form of one set of advice for marketers who are willing to use futures and options (although futures and options are not always used), and a separate set of advice for producers who only wish to make cash sales.⁵ In this situation, both strategies are recorded and treated as distinct programs to be evaluated.⁶

When a recommendation is made regarding the marketing of wheat, the recommendation is recorded. In recording recommendations, specific attention is paid to which year’s crop is being sold, (e.g., 1998 crop), the amount of the commodity to be sold, which futures or options contract is to be used (where applicable), and any price targets that are mentioned. When price targets are given and not immediately filled, such as a stop order in the futures market, the recommendation is noted until the order is either filled or canceled.

Several procedures are used to check the recorded recommendations for accuracy and completeness. Whenever possible, recorded recommendations are cross-checked against later status reports provided by the relevant advisory service. Also, at the completion of the marketing period, it is confirmed whether cash sales total 100 percent, all futures positions are offset, and all options positions are offset or expire.

The final set of recommendations attributed to each advisory program represents the best efforts of the AgMAS Project staff to accurately and fairly interpret the information made available by each advisory program. In cases where a recommendation is considered vague or unclear, some judgment is exercised as to whether or not to include that particular recommendation or how to implement the recommendation. Given that some recommendations are subject to interpretation, the possibility is acknowledged that the AgMAS track record of recommendations for a given program may differ from that stated by the advisory program, or from that recorded by another subscriber.

Calculating the Returns to Marketing Advice

At the end of the marketing period, all of the (filled) recommendations are aligned in chronological order. The advice for a given marketing period is considered to be complete for each advisory program when cumulative cash sales of the commodity reach 100 percent, all futures positions covering the crop are offset, all options positions covering the crop are either offset or expire, and the advisory program discontinues giving advice for that crop year. The

⁵ Some of the programs that are depicted as “cash-only” do in fact have some futures-related activity, due to the use of hedge-to-arrive contracts, basis contracts and some use of options.

⁶ If a service clearly differentiates strategies based on the availability of on-farm versus off-farm (commercial) storage, recorded recommendations reflect the off-farm storage strategy.

returns to each recommendation are then calculated in order to arrive at a weighted average net price that would be received by a producer who precisely follows the marketing advice (as recorded by the AgMAS Project).

In order to produce a consistent and comparable set of results across the different advisory programs, certain explicit assumptions are made. These assumptions are intended to accurately simulate “real-world” marketing conditions.

Wheat Class and Geographic Location

An issue of first importance is the appropriate class of wheat and location of production to use in the simulation. In the US, six classes of wheat are grown and there are five wheat futures contracts traded on three different exchanges. Of the six classes, three represent a relatively small level of production: durum, hard white and soft white wheat. Of the three large classes of wheat, in 1998 the United States produced 1.2 billion bushels of hard red winter wheat, 486 million bushels of hard red spring, and 443 million bushels of soft red winter wheat. Each of these classes has its own distinct characteristic for the milling and baking industry, and each class is characterized by the time planted and harvested.

The simulation is designed to reflect conditions facing a representative soft red winter wheat producer in southwest Illinois. Whenever possible, data are collected for the West Southwest Crop Reporting District in Illinois as defined by the National Agricultural Statistics Service (NASS) of the US Department of Agriculture (USDA). The thirteen counties (Cass, Pike, Scott, Morgan, Sangamon, Christian, Calhoun, Greene, Macoupin, Montgomery, Jersey, Madison, and Bond) that make up this District are highlighted in Figure 1. For ease of reading, this area will be referred to in the remainder of this report as southwest Illinois, unless it is necessary to reference the actual crop or price reporting district.

There are two principal reasons that soft red winter wheat in southwest Illinois is used as the basis for the simulation. The first reason is that soft red winter wheat recommendations are the most common class of wheat recommendations made by advisory programs. All but one of the programs either specifically make recommendations for this class of wheat or the recommendations most closely align with this class of wheat. There are three programs included in the former category; that is, they specifically identify recommendations by class of wheat. The remaining programs do not specifically identify the class of wheat, but several pieces of evidence point in the direction of soft red winter wheat as the target class:

- i) Most futures hedging advice refers to the Chicago Board of Trade (CBOT) wheat contract. In addition, all but one hedge-to-arrive contract recommendation is based on the CBOT and the vast majority of cash sales are based on CBOT futures prices. It is important to note that all the services that provide specific recommendations for individual classes use the Kansas City Board of Trade (KCBOT) contract for hard red winter, the Minneapolis Grain Exchange (MGE) contract for hard red spring, and the CBOT contract for soft red winter.

- ii) The programs generally make harvest recommendations for June and early July. Because the harvest of spring wheat generally occurs in late summer, while harvest of winter wheat occurs in early summer, the assumption can be made that the recommendations are for winter wheat.
- iii) The programs that give basis advice primarily recommend basis levels in soft red winter wheat production areas.

The second reason that soft red winter wheat in southwest Illinois is used in the simulation is data availability. An exhaustive search was conducted for a public series of daily cash and forward contract prices for interior elevators in major hard red winter, hard red spring, and soft red winter wheat production areas of the US. Several public sources of cash spot prices were located for each of the different classes. However, the only public source of forward contract prices is Illinois Ag Market News, and they only report bids for soft red winter wheat. This is an important limiting factor, as many advisory programs make substantial use of pre-harvest forward contracts. It may be possible to obtain forward contract prices from private sources in other regions, but this is costly and may result in forward price data of uncertain accuracy.

In only one instance did a service fail to provide recommendations that could be applied to the soft red winter wheat market. Agri-Mark did a majority of hedging with MGE wheat contracts and only provided harvest recommendations applicable to hard red spring wheat. As a result, Agri-Mark is not included in this evaluation.

The final assumption needed for this aspect of the simulation is the particular production region in Illinois. The West Southwest Crop Reporting District is chosen for several reasons. First, a price reporting district is available that overlaps part of this crop reporting district (see Figure 2). Second, available cash prices for this district come primarily from non-terminal, interior elevators. Third, this price reporting region has the most complete set of cash prices for the marketing window. Fourth, while the West Southwest Crop Reporting District is not the largest wheat producing region in Illinois, it consistently ranks in the top four production areas in the state, with 206,000 acres harvested and 10.5 million bushels produced in 1998.

An important question is the degree to which performance results based on soft red winter wheat production in southwest Illinois can be generalized to other classes and locations of wheat production in the US. To provide some perspective on this question, yields and prices for two other areas of wheat production in the US are compared to southwest Illinois. Figure 3 presents the wheat yield history for the West Southwest Illinois Crop Reporting District (soft red winter), Southwest Kansas Crop Reporting District (hard red winter), and Northeast South Dakota Crop Reporting District (hard red spring) over 1972-1998. Yields have trended upward in each area. Hence, a valid correlation across the production areas can only be made after removing the upward trend from the yields for each area. Figure 4 presents the relationship between deviations from trend across the areas and the corresponding correlation coefficients. A correlation coefficient can be between positive one and negative one. The correlation of the deviations from trend shows a weak positive relationship between the yield deviations for southwest Illinois and

the other two regions. There is only a slight tendency for southwest Illinois wheat yields to be above trend at the same time that Kansas or South Dakota yields are above trend, and vice versa.

Further evidence of the divergent yield pattern across the three wheat production areas is found in Table 1, which focuses on yield and deviation from trend over the past four years, the same period as the analysis of advisory service performance in pricing wheat. There is not a single year over the 1995 to 1998 period in which the direction of deviation from trend is the same for all three areas. Yields in 1995 and 1996 are below trend for Illinois and Kansas, but above trend in South Dakota. Yield in 1997 is above trend for Illinois, but near trend in Kansas and below trend in South Dakota. Finally, yield in 1998 is below trend in Illinois, above trend in Kansas and near trend in South Dakota.

The history of daily cash prices for wheat in Illinois, Kansas and South Dakota is presented in Figures 5 and 6 for the period June 1995 through May 1999. Soft red winter wheat prices are shown for the West Southwest Illinois Price Reporting District, hard red winter wheat prices are shown for the Western Kansas Price Reporting District and hard red spring wheat prices are shown for the East River South Dakota Price Reporting District. These price districts most closely match the crop districts used above to compare yields. Comparison of the price histories for the three areas suggests wheat prices track fairly closely. However, there are periods when the relationship changes. An example is 1997, when Kansas hard red winter wheat prices moved from a premium relative to South Dakota hard red spring wheat prices to a discount.

A more formal analysis of the relationship of cash prices between the three areas is reported in Figure 7. Price changes are analyzed because the time series properties of commodity prices strongly suggest that unbiased estimates of price correlations should be based on price changes rather than price levels.⁷ The correlations are highly positive between Illinois and the other two areas. Not surprisingly, a high correlation is observed between Illinois and Kansas, as these two areas produce winter wheat. It is interesting to note that the correlation estimate of 0.83 is quite close to similar estimates reported in studies of optimal wheat cross-hedging.⁸ The correlation is also high between Illinois and South Dakota, even though Illinois produces winter wheat and South Dakota produces spring wheat. Finally, while these correlations are based on cash prices, it is expected that similar correlations exist across futures prices for the different wheat classes, due to inter-market spread trading and arbitrage.

The previous results present a mixed picture regarding the degree to which performance results based on soft red winter wheat production in southwest Illinois can be generalized to other classes and locations of wheat production in the US. On one hand, there appears to be little relationship in wheat yields across classes and locations. On the other hand, there is a highly positive relationship between wheat prices across classes and locations. It is an empirical

⁷ Brown, S.L. "A Reformulation of the Portfolio Model of Hedging." *American Journal of Agricultural Economics*. 67(1985):508-512.

⁸ Brorsen, B.W. "Hedging Hard Red Winter Wheat: Kansas City versus Chicago." *Journal of Futures Markets*. 18(1998):449-466.

question whether the lack of a relationship between yields or the positive relationship between prices has the dominant impact on performance evaluations. One plausible outcome is that the low correlation in yields is more than offset by the high correlation in prices, and hence, it is reasonable to generalize performance evaluations for soft red winter wheat production in southwest Illinois to other wheat classes and locations. An equally plausible outcome is that the low correlation in yields more than offsets the high correlation in prices, and hence, it is unreasonable to generalize performance evaluations for soft red winter wheat production in southwest Illinois to other wheat classes and locations. Until empirical evidence is available on this question, caution is suggested before attempting to generalize the performance results to other wheat classes and locations.

Marketing Window

In general, a two-year marketing window, spanning June 1st of the year prior to harvest through May 31st of the year following harvest, is used in the analysis. The beginning date is selected because it reflects a time at which new crop sales begin. The ending date is selected to be consistent with the ending date for wheat marketing years as defined by the USDA.

There are some exceptions to the marketing window definition. Three advisory programs have relatively small amounts (15 percent or less) of cash wheat unsold at the end of the 1995 marketing period (May 31, 1996). The last cash sale by an advisory program for the 1995 crop is made on October 18, 1996. Six advisory programs do not complete cash sales by the end of the 1996 marketing period (May 31, 1997). These six programs have between 5 and 60 percent of the 1996 crop unsold. The last cash sale for these positions is made on August 12, 1997. One program does not make any cash sales by the end of the 1996 marketing year, but did complete cash sales by June 10, 1997. Five programs have between 10 and 100 percent of the 1997 wheat crop unsold at the end of the 1997 marketing period (May 31, 1998). The last cash sale for four of these programs is completed by August 12, 1999. The other program continues to hold all of the 1997 wheat crop. Four programs have between 10 and 100 percent of the 1998 wheat crop unsold at the end of the 1998 marketing period (May 31, 1999). One program, with the smallest amount of unsold cash wheat, ten percent, makes its last cash sale on June 8, 1999. Another program, with 75 percent unsold at the end of the 1998 marketing period, makes its last cash sale on April 3, 2000. The remaining two programs continue to hold all of the 1998 wheat crop.

The discussion in the previous paragraph indicates a unique problem not confronted in other AgMAS pricing evaluations.⁹ That is, two programs did not complete marketing of wheat by the time of the analysis for this report, June 2000. The specifics of these positions are worth noting. As of May 31, 2000, the Allendale (futures only) program had not recommended any

⁹ Good D.L., S.H. Irwin, T.E. Jackson, and G.K. Price, "1995 Pricing Performance of Market Advisory Services for Corn and Soybeans." AgMAS Project Research Report 1997-01, March 1997; Jackson T.E., S.H. Irwin, and D.L. Good, "1996 Pricing Performance of Market Advisory Services for Corn and Soybeans." AgMAS Project Research Report 1998-01, March 1998; Jackson T.E., S.H. Irwin, and D.L. Good, "1997 Pricing Performance of Market Advisory Services for Corn and Soybeans." AgMAS Project Research Report 1999-01, February 1999; and, Good D.L., S.H. Irwin, T.E. Jackson, M.A. Jirik, and J. Martinez-Filho, "1998 Pricing Performance of Market Advisory Services for Corn and Soybeans." AgMAS Project Research Report 2000-01, February 2000.

cash sales for either the 1997 or 1998 wheat crops. However, both crops are fully hedged using wheat futures. As of May 31, 2000, Ag Profit by Hjort Associates had not sold any of the 1998 wheat crop. In order to complete the analysis for these two programs, the futures positions and all remaining cash quantities are marked-to-the-market as of May 31, 2000. Future AgMAS wheat pricing reports will update and revise results when these programs make final pricing decisions.

Prices

The cash price assigned to each cash sale recommendation is the West Southwest Illinois Price Reporting District closing, or overnight, bid. The West Southwest Illinois Price Reporting District is highlighted in Figure 2. Similarly, the forward contract price assigned to all pre-harvest forward sales is the forward bid for the West Southwest Price Reporting District. The cash and forward contract data are collected and reported by the Illinois Department of Ag Market News.¹⁰ Cash and forward contract prices in this area best reflect prices for the assumed geographic location of the representative southwest Illinois producer (West Southwest Illinois Crop Reporting District).

There are two periods when cash wheat prices are not publicly reported by the Illinois Department of Ag Market News: May 1, 1996 – June 12, 1996 and October 1, 1998 – May 28, 1999. While the Illinois Department of Ag Market News does not report cash prices for these two periods, it continues to survey elevators and collect price data. This data is obtained directly from the Illinois Department of Ag Market News and the cash wheat price is computed by taking the midpoint of the high and the low prices reported by elevators for the West Southwest Price Reporting District. In addition, there are six business days when cash prices are not reported publicly and the Illinois Department of Ag Market News does not collect price data (April 24-30, 1996; December 17, 1998). For these six days, cash prices are estimated. The first step in the estimation is to compute the average spatial basis between the St. Louis terminal cash wheat price and West Southwest Price Reporting District wheat price for the five days before and after the missing date. Next, the average spatial basis is added to the St. Louis cash price on the missing date to obtain a representative cash price for the West Southwest Price Reporting District.

Since the marketing window for the wheat crop begins in June of the year prior to harvest, and the Illinois Department of Ag Market News does not typically begin reporting actual cash forward bids until January before harvest, pre-harvest prices need to be estimated for the first seven months of the marketing window. Between June 1st and January prior to harvest, a two-step estimation procedure is adopted. First, the forward basis for the period in question is estimated using the average forward basis for the first five days that actual forward contract bids are reported by the Illinois Department of Ag Market News.¹¹ Second, the estimated forward basis is subtracted from the settlement price of the Chicago Board of Trade (CBOT) July wheat

¹⁰ The daily prices can be found in at the following website: http://www.ams.usda.gov/mnreports/GX_GR113.txt.

¹¹ The five-day average forward basis for each year is as follows: 1995, 23 cents; 1996, 30 cents; 1997, 18 cents; 1998, 21 cents.

futures contract for the respective years during the period when forward contract data are missing. This estimation procedure is expected to be a reasonably accurate reflection of actual forward cash prices for the early period of the marketing window, as the actual price of the harvest futures contract is used and only the forward basis is estimated.

The fill prices for futures and options transactions generally are the prices reported by the services. In cases where a service did not report a specific fill price, the settlement price for the day is used. This methodology does not account for liquidity costs in executing futures and options transactions.¹²

Quantity Sold

Since most of the advisory program recommendations are given in terms of the proportion of total production (e.g., “sell 10 percent of 1998 crop today”), some assumption must be made about the amount of production to be marketed. For the purposes of this study, if the per-acre yield is assumed to be 50 bushels, then a recommendation to sell 10 percent of the wheat crop translates into selling 5 bushels. When all of the advice for the marketing period has been carried out, the final per-bushel selling price is the average price for each transaction weighted by the amount marketed in each transaction.

The above procedure implicitly assumes that the “lumpiness” of futures and/or options contracts is not an issue. Lumpiness is caused by the fact that futures contracts are for specific amounts, such as 5,000 bushels per CBOT wheat futures contract. For large-scale producers, it is unlikely that this assumption adversely affects the accuracy of the results. This may not be the case for small- to intermediate-scale producers who are less able to sell in 5,000-bushel increments.¹³

Yields and Harvest Definition

When making hedging or forward contracting decisions prior to harvest, the actual yield is unknown. Hence, an assumption regarding the amount of expected production per acre is necessary to accurately reflect the returns to marketing advice. As shown earlier in Table 1, wheat yields in southwest Illinois vary greatly over 1995-1998. When yield is near or above trend, there is not normally a problem in meeting forward pricing obligations. Hence, in a “normal” crop year, expected yield is assumed to equal trend yield for the entire pre-harvest period. The adjustment from expected to actual yield in this case is assumed to occur on the first day of wheat harvest. The expected yield for the West Southwest Illinois Crop Reporting District

¹² Liquidity costs reflect the fact that non-floor traders must buy at the ask price and sell at the bid price. The difference between the bid and ask prices, termed the bid-ask spread, is the return earned by floor traders for “making the market.”

¹³ The practical importance of “lumpiness” problems even for small farms may be limited, due to the availability of “mini-contracts” at the Mid-America Exchange. These futures and options contracts are specified in 1,000 bushel increments.

is computed from a linear regression trend model of actual yields from 1972 through the year previous to harvest. For example, the trend yield forecast for 1998 is based on a regression using 1972 to 1997 yield data. Previous research suggests a regression trend model produces relatively accurate yield forecasts.¹⁴

When actual yield is substantially below trend, and forward pricing obligations are based on trend yields, a producer may have difficulty meeting such obligations. This raises the issue of updating yield expectations in “short” crop years to minimize the chance of defaulting on forward pricing obligations.

A relatively simple procedure is used to update yield expectations in short crop years. First, trend yield is used as the expected yield until the May USDA *Crop Production Report* is released, typically around May 10th. Second, if the USDA wheat yield estimate for Illinois is 20 percent (or more) lower than trend yield, a “reasonable” producer is assumed to change yield expectations to the lower USDA estimate. Third, as with normal crop years, the adjustment to actual yield is assumed to occur on the first day of harvest.

The 20 percent threshold is intentionally relatively large for at least three reasons. First, it is desirable to make adjustments to the trend yield expectation on a limited number of occasions. Given the large variability in annual yields, a small threshold could result in frequent adjustments. Second, it is not uncommon for early yield estimates to deviate significantly from the final estimate. A small threshold could result in unnecessary adjustments prior to harvest. Third, yield short-falls of less than 20 percent are unlikely to create delivery problems for a producer.

In southwest Illinois, 1995, 1997, and 1998 are classified as “normal” crop years. The trend yield for 1995 is calculated to be 56 bushels per acre (bpa). A short crop adjustment is not triggered in 1995 since the May USDA estimate did not indicate a deviation below trend greater than 20 percent. Therefore, recommendations regarding the marketing quantity made prior to harvest are based on yields of 56 bpa. For example, a recommendation to forward contract twenty percent of expected 1995 production translates into a recommendation to contract 11.2 bpa (20 percent of 56). The actual reported wheat yield in southwest Illinois in 1995 is 45 bpa. The trend yield in 1997 is 52 bpa and actual production is 65 bpa. The trend yield in 1998 is 54 bpa and actual production is 51 bpa. In neither of these latter two years does the May USDA estimate trigger a short-crop yield expectation adjustment.

In southwest Illinois, 1996 is classified as a “short” crop year. The trend yield for 1996 is 54 bpa. Using the procedure described above, a short-crop adjustment is triggered because USDA’s estimate of yield in May 1996 is 41 bpa, more than 20 percent below trend. Therefore, forward sales recommended after the USDA estimate is released are based on an expected yield of 41 bpa. The actual yield in 1996 is 38 bpa, 30 percent less than trend.

¹⁴ Fackler, P.L., D.L. Young, and G.A. Carlson. "Estimates of Trend and Variability Patterns in U.S. Crop Yields," in *Quantifying Long Run Agricultural Risks and Evaluating Farmers' Responses to Risk*. Proceedings of a seminar sponsored by the Southern Regional Project S-252, Jekyll Island, Georgia, March 1993.

Since harvest occurs at different dates each year, estimates of harvest progress, as reported by NASS in Illinois, are used to determine the actual date of harvest. Harvest progress estimates typically are not made soon enough to identify precisely the beginning of harvest, so an estimate is made based upon available data. Specifically, the date on which 50 percent of the crop is harvested is defined as the "mid-point" of harvest. The entire harvest period then is defined as a three-week window, beginning one and one-half weeks before the harvest mid-point, and ending one and one-half weeks after the harvest mid-point. In most years, a three-week window includes at least 80 percent of the harvest.

For 1995, the harvest period for wheat is defined as June 23, 1995 through July 14, 1995. For 1996, the harvest period is June 25, 1996 through July 16, 1996. For 1997, the harvest period is June 27, 1997 to July 18, 1997. Finally, the 1998 harvest period is June 18, 1998 to July 8, 1998. As stated earlier, wheat recommendations made after the beginning harvest dates are applied on the basis of actual yields.

For the purpose of this study, the actual harvest yield must exactly equal total cash sales of the crop at the end of the marketing window. Hence, an adjustment in yield assumptions from expected to actual levels must be applied to cash transactions at some point in time. In normal crop years, an adjustment is made to the amount of the first cash sale after the beginning of the harvest period. For example, if a program advises forward contracting 50 percent of the 1998 wheat crop prior to harvest, this translates into sales of 27 bpa (50 percent of 54). However, when the actual yield is applied to the analysis, sales-to-date of 27 bpa imply that 52.94 percent ($[27/51]*100$) of the actual crop has been contracted. In order to compensate, the amount of the next cash sale is adjusted to align the amount sold. In this example, if the next cash sale recommendation is for a 10 percent increment of the 1998 crop, making the total recommended sales 60 percent of the crop, the recommendation is adjusted to 7.06 percent ($60 - 52.94$) of the actual yield (3.6 bushels), so that the total crop sold to date is 60 percent of 51.0 bushels per acre ($27 + 3.6 = 0.6*51 = 30.6$ bushels). After this initial adjustment, subsequent recommendations are taken as percentages of the 51 bpa actual yield, so that sales of 100 percent of the crop equal sales of 51 bpa.

In short crop years there is an additional adjustment made in May. For example, if a program advised forward contracting 50 percent of the 1996 crop prior to May 1996, this would be 27 bpa (50 percent of 54). If on May 30, 1996, a program recommends forward contracting another 25 percent of the crop and an expected yield of 54 bpa is used, the producer would forward contract another 13.5 bpa (25 percent of 54), for a total forward contract amount of 40.5 bpa ($27 + 13.5 = 40.5 = 0.75*54$). However, the actual yield for 1996 is only 38 bpa! As noted above, it is assumed that a "reasonable" producer uses the May USDA Crop Report estimate of 41 bpa for forward contracting purposes. Now assume that on May 30, 1996, that same recommendation to forward contract 25 percent of expected production is made. This brings the amount forward contracted to a total of 75 percent of the crop. This sale is adjusted, so that the

actual bushels contracted is 3.75 bpa ($27 + 3.75 = 0.75 \times 41 = 30.75$ bushels).¹⁵ On the first cash sale after harvest, there is an additional adjustment. In this example, if the next cash sale recommendation is after the harvest for a 10 percent increment of the 1996 crop, making the total recommended sales 85 percent of the crop, the recommendation is adjusted to 4 percent of the actual yield (1.55 bushels), so that the total crop sold to date is 85 percent of 38 bushels per acre ($27 + 3.75 + 1.55 = 0.85 \times 38 = 32.3$ bushels). After this initial adjustment, subsequent recommendations are taken as percentages of the 38 bpa actual yield, so that sales of 100 percent of the crop equal sales of 38 bpa.

While the amount of cash sales is adjusted to reflect the change in yield information, a similar adjustment is not made for futures or options positions that are already in place. For example, assume that a short futures hedge is placed in the July 1998 contract for 25 percent of the 1998 crop prior to harvest. Since the amount hedged is based on the trend yield assumption of 54 bpa, the futures position is 13.5 bpa (25 percent of 54). After the yield assumption is changed, this amount represents a short hedge of 26.47 percent ($[13.5/51] \times 100$). The amount of the futures position is not adjusted to move the position to 25 percent of the new yield figure. However, any futures (or options) positions recommended after the beginning of harvest are implemented as a percentage of the actual yield.

Brokerage Costs

Brokerage costs are incurred when producers open or close positions in futures and options markets. For the purposes of this study, it is assumed that brokerage costs are \$50 per contract for round-turn futures transactions, and \$30 per contract to enter or exit an options position. Further, it is assumed that CBOT wheat futures or options contracts are used, and the contract size for each commodity is 5,000 bushels. Therefore, per-bushel brokerage costs are 1 cent per bushel for a round-turn futures transaction and 0.6 cents per bushel for each options transaction.

LDP and Marketing Assistance Loan Payments

While the 1996 “Freedom-to-Farm” Act did away with government set-aside and target price programs, price protection for producers in program crops such as wheat are not eliminated entirely. Minimum prices are established through a “loan” program. Specifically, if market prices are below the Commodity Credit Corporation (CCC) loan rate for wheat, producers can receive payments from the US government that make up the difference between the loan rate and the lower market price.¹⁶ There is considerable flexibility in the way the loan program can be

¹⁵ It is possible using even these assumptions for an advisory program to forward contract more than is actually produced. This would occur if a program forward contracted a large proportion of expected production before May of a short crop year. This does not occur for any advisory program in wheat.

¹⁶ For a complete description of the programs discussed in this section, see the following Farm Service Agency fact sheets: *Nonrecourse Marketing Assistance Loans and Loan Deficiency Payments*, March 1998; *Feed Grains*, March 1998; and *Soybeans and Minor Oilseeds*, July 1998. These can be found at <http://www.fsa.usda.gov/pas/publications/facts/pubfacts.htm>.

implemented by producers. This flexibility presents the opportunity for advisory programs to make specific recommendations for the implementation of the loan program. Additionally, the price of wheat was below the loan rate during significant periods of time in the 1998 marketing period, so that use of the loan program was an important part of marketing strategies for this period. As a result, net advisory program prices may be substantially impacted by the way the provisions of the loan program are implemented. It should be noted that loan program decisions are only considered for 1998 marketing year and are not considered for the 1995 through 1997 crops, unless specifically recommended, because the market price exceeded the loan rate.

Most of the advisory programs tracked by the AgMAS Project for the 1998 crop make specific recommendations regarding the timing and method of implementing the loan program for the entire wheat crop.¹⁷ These recommendations are implemented as given wherever feasible. Several decision rules have to be developed even in this case, in particular, for pre-harvest forward contracts. For a few programs, loan recommendations are incomplete or not made at all. For these cases, it is necessary to develop a more complete set of decision rules for implementing the loan program in the marketing of wheat. All loan-related decision rules are based on the assumption of a “prudent” or “rational” producer, within the context of the intent of the loan program. More specifically, it is assumed that a producer will take advantage of the price protection offered by the loan program, even in the absence of specific advice from an advisory program.

Before describing the decision rules, it is useful to provide a brief overview of the loan program mechanics. Then, the rules developed to implement the loan program in the absence of specific recommendations can be described more effectively.

Program Mechanics

There are two mechanisms for implementing the price protection benefits of the loan program. The first mechanism is the loan deficiency payment (LDP) program. LDPs are computed as the difference between the loan rate for a given county and the posted county price (PCP) for a particular day. PCPs are computed by the USDA and change each day in order to reflect the “average” market price that exists in the county. For example, if the county loan rate for wheat is \$2.50 per bushel and the PCP for a given day is \$2.00 per bushel, then the next day LDP is \$0.50 per bushel. If the PCP increases the next day to \$2.10 per bushel, the LDP after the next day will decrease to \$0.40 per bushel. Conversely, if the PCP decreases the next day to \$1.90 per bushel, after the next day the LDP will increase to \$0.60 per bushel.¹⁸

LDPs are made available to producers over the period beginning with wheat harvest and ending March 31st of the calendar year following harvest. Producers have flexibility with regard to taking the LDP. They may simply elect to take the payment when the crop is sold in a spot

¹⁷ Sixteen of the 21 wheat programs make a complete set of loan recommendations (100 percent of actual production) for the 1998 crop.

¹⁸ Technically, PCPs for a given day are used by the USDA to compute LDPs for the following day.

market transaction (before the end of March in the particular marketing year). Or, producers, after harvest, can choose to take the LDP before the crop is delivered and sold. Note that LDPs for the 1998 crop cannot be taken after a crop has been delivered and title has changed hands.

The second mechanism is the nonrecourse marketing assistance loan program. A loan cannot be taken on any portion of the crop for which an LDP has been received. Under this program, producers may store the crop (on the farm or commercially), maintain beneficial interest, and receive a loan from the CCC using the stored crop as collateral. The loan rate is the established rate in the county where the crop is stored and the interest rate is established at the time of loan entry. Wheat can be placed under loan anytime after the crop is stored through March 31st of the following calendar year. The loan matures on the last day of the ninth month following the month in which the loan was made.

Producers may settle outstanding loans in two ways: i) repaying the loan during the 9-month loan period, or ii) forfeiting the crop to the CCC at maturity of the loan. Under the first alternative, the loan repayment rate is the lower of the county loan rate plus accrued interest or the marketing loan repayment rate, which is the PCP. If the PCP is below the county loan rate, the economic incentive is to repay the loan at the posted county price. The difference between the loan rate and the repayment rate is a marketing loan gain (MLG). If the PCP is higher than the loan rate, but lower than the loan rate plus accrued interest, the incentive is also to repay the loan at the PCP. Interest is charged on the difference between the PCP and the loan rate. If the PCP is higher than the loan rate plus accrued interest, the incentive is to repay the loan at the loan rate plus interest.

Under the second alternative, the producer stores the crop to loan maturity and then transfers title to the CCC. The producer retains the proceeds from the initial loan. This was generally not an attractive alternative in the 1998 marketing year since the PCP was often below the cash price of wheat. Repaying the loan at the PCP and selling the crop at the higher cash price was economically superior to forfeiture.

The nonrecourse loan program establishes the county loan rate as a minimum price for the producer, as does the LDP program. For the 1998 crop, the sum of LDPs plus marketing loan gains was subject to a payment limitation of \$75,000 per person. Forfeiture on the loans provided the mechanism for receiving a minimum of the loan rate on bushels in excess of the payment limitation.

The average loan rates for the 1998 wheat across the thirteen counties in the West Southwest Illinois Crop Reporting District (Bond, Calhoun, Cass, Christian, Greene, Jersey, Macoupin, Madison, Montgomery, Morgan, Pike, Sangamon, and Scott) is \$2.57 per bushel. Market prices fell below that rate for extended periods of time during the 1998 marketing year. This is reflected in Figure 8, which shows the average wheat LDP or MLG rates for the West Southwest Illinois Crop Reporting District during the 1998 marketing year.^{19,20} LDPs or MLGs

¹⁹ LDP and MLG data were obtained from the Farm Services Agency of the USDA via a Freedom of Information Act request.

vary greatly during harvest, from zero cents to 20 cents per bushel, and then rise to 60 cents or greater during late summer, decline in the fall and rise to maintain a level at or above 25 cents for the remainder of the marketing year.

Decision Rules for Programs with a Complete Set of Loan Recommendations

If an advisory program makes a complete set of loan recommendations, the specific advice is implemented wherever feasible. However, specific decision rules are still needed regarding pre-harvest forward contracts because it is possible for an advisory program to recommend taking the LDP on those sales before it is actually harvested and available for delivery in southwest Illinois. To begin, it is assumed that amounts sold for harvest delivery with pre-harvest forward contracts are delivered first during harvest. Since LDPs must be taken when title to the grain changes hands, LDPs are assigned as these “forward contract” quantities are harvested and delivered. This necessitates assumptions regarding the timing and speed of harvest. Earlier it was noted that a three-week harvest window is used to define harvest. This window is centered on the day nearest to the mid-point of harvest progress as reported by NASS. Various assumptions could be implemented regarding harvest progress during this window. Lacking more precise data, a reasonable assumption is that harvest progress for an individual, representative farm is a linear function of time.

Table 2 summarizes the information used to assign LDPs to pre-harvest forward contracts. The second column shows the amount harvested assuming a linear model. The third column shows the LDP available on each date of the harvest window and the third column presents the average LDP through each harvest date. An example will help illustrate use of the table. Assume that an advisory program recommends, at some point before harvest, that a producer forward contract 50 percent of expected wheat production. This translates into 27 bpa when the percentage is applied to expected production ($0.50 * 54 = 27$). Next, convert the bpa to a percentage of actual production, which is 52.94 percent ($[(27/51) * 100] = 52.94$). To determine the LDP payment on the 52.94 percent of actual production forward contracted, simply read down Table 2 to June 29, which is the date when 53.3 percent of harvest is assumed to be complete. The average LDP up to that date (June 18, 1998 to June 29, 1998) is \$0.02 per bushel. This is the LDP amount assigned to the forward contract bushels.

Note that LDPs for any sales (spot, forward contracts, futures or options) recommended during harvest are taken only after all forward contract obligations are fulfilled. In addition, crops placed under loan by an advisory program do not accumulate interest opportunity costs because proceeds from the loan can be used to offset interest costs that otherwise would accumulate.

Decision Rules for Programs with a Partial Set of Loan Recommendations Or No Loan Recommendations

²⁰ The time period for Figure 8 begins June 1st 1998 and ends on May 31, 1999.

If an advisory program makes a partial set of loan recommendations, the available advice is implemented wherever feasible. In the absence of specific recommendations, it is assumed that crops priced before March 31, 1999 are not placed under loan. Those crops receive program benefits through LDPs. After March 31, 1999, eligible crops (unpriced crops for which program benefits have not yet been collected) are assumed to be under loan until priced.

In the absence of specific recommendations, rules for assigning LDPs and MLGs are developed under the assumption that loan benefits are established when the crop is priced or as soon after pricing that is allowed under the rules of the program. This principle is consistent with the intent of the loan program to fix a minimum price when pricing decisions are made. Two rules are most important in the implementation of this principle. First, LDPs on pre-harvest sales (forward contracts, futures or options) are established as the crop is harvested. Second, if the LDP or MLG is zero on the pricing date, or the first date of eligibility to receive a loan benefit, those values are assigned on the first date when a positive value is observed, assuming a beneficial interest in that portion of the crop has been maintained. Specific rules for particular marketing tools and situations follow:

- 1) *Pre-harvest forward contracts.* The same decision rules are applied as discussed in the previous section. Specifically, it is assumed that amounts sold for harvest delivery with pre-harvest forward contracts are delivered first during harvest. LDPs, if positive, are assigned as these “forward contract” quantities are harvested and delivered. This necessitates assumptions regarding the timing and speed of harvest. A linear model of harvest progress is assumed in the three-week harvest window. The specific information used to assign LDPs to pre-harvest forward contracts is again found in Table 2. As a final point, note that LDPs for any other sales (spot, futures or options) recommended during harvest are taken only after all pre-harvest forward pricing obligations are fulfilled.
- 2) *Pre-harvest short futures.* Pre-harvest pricing using futures contracts is treated in the same manner as pre-harvest forward contracts. LDPs are assigned on open futures positions as the crop is harvested, or as soon as a positive LDP is available, if the futures position is still in place and cash sales have not yet been made. These are assigned after forward contracts have been satisfied. If the underlying crop is sold before there is a positive LDP, then that portion of the crop receives a zero LDP. If the futures position is offset before a positive LDP is available and the crop has not yet been sold in the cash market, that portion of the crop is eligible for loan benefits on the next pricing recommendation.
- 3) *Pre-harvest put option purchases.* Long put options positions, which establish a minimum futures price, are treated in the same manner as pre-harvest short futures.
- 4) *Post-harvest forward contracts.* The main issue with respect to post-harvest forward contracts is when to assign the LDPs or MLGs. Those can be established on the date the contract is initiated, on the delivery date of the contract, or anytime in between. Following the general principle outlined earlier, LDPs and MLGs for post-harvest contracts are assigned on the date the contract is initiated or the first day with positive benefits prior to delivery on the contract.

- 5) *Post-harvest short futures.* As with post-harvest forward contracts, the main issue with post-harvest short futures positions is when to assign loan benefits. These are assigned when the short futures position is initiated or as soon as a positive benefit is available if the futures position is still in place and cash sales have not been made. If the underlying crop is sold before a positive LDP is available, that portion of the crop receives a zero LDP. If the short futures position is offset before a positive LDP is available and the cash crop has not yet been sold, that portion of the crop is eligible for loan benefits on the next pricing recommendation.
- 6) *Post-harvest long put positions.* Long put options positions established after the crop is harvested are treated in the same manner as post-harvest short futures.
- 7) *Spot sales before March 31, 1999.* If a spot cash sale of wheat is recommended before March 31, 1999, it is assumed that the LDP, if positive, is established that same day.
- 8) *Loan program after March 31, 1999.* Since LDPs are not available after March 31, 1999, it is assumed that any wheat in storage and not priced as of this date, for which loan benefits have not been established, are entered in the loan program on that date. This is a reasonable assumption since spot prices were below the loan rate for wheat in southwest Illinois on March 31 and a prudent producer would take advantage of the price protection offered by the loan program. When the crops are subsequently priced (cash sale, forward contract, short futures, or long put options), the marketing loan gain, if positive, is assigned on that day. Forfeiture is not an issue for these bushels because all cash sales were made before the end of nine-month loan period (December 31, 1999). Note also that the \$75,000 payment limitation is not considered in the analysis, as production is based on one acre of wheat.

Carrying Charges

An important element in assessing returns to an advisory program is the economic cost associated with storing grain instead of selling grain immediately at harvest. The cost of storing grain after harvest (carrying costs) consists of two components: physical storage charges and the opportunity cost incurred by foregoing sales when the crop is harvested. Physical storage charges can apply to off-farm (commercial) storage, on-farm storage, or some combination of the two. Opportunity cost is the same regardless of the type of physical storage.

For the purposes of this study, it is assumed that all storage occurs off-farm at commercial sites.²¹ This is assumed for several reasons. First, commercial storage costs reflect the full economic costs of physical storage, whereas on-farm storage cost estimates may not, due to differing accounting methods and/or time horizons. Second, commercial storage costs are

²¹ As mentioned earlier in this report, there are some instances where a service clearly differentiates strategies based on availability of on-farm versus off-farm (commercial) storage. In these instances, recorded recommendations reflect the off-farm storage strategy.

relatively consistent across producers in a given area, whereas on-farm storage costs likely vary substantially among producers. Third, commercial storage cost data are readily available, whereas this is not the case for on-farm storage.

Storage charges are assigned beginning with the first day after the end of a harvest window. Physical storage charges have a fixed component (in-charge) of 4 cents per bushel that is assigned the day storage begins. The variable component is 2.5 cents per bushel per month, with this charge pro-rated to the day when the cash sale is made. The storage costs represent the typical storage charges for the 1995, 1996, 1997, and 1998 wheat crops quoted in a telephone survey of southwest Illinois elevators.

The interest rate is assumed to be 9.5 percent for 1995, 8.6 percent for 1996, 9.4 percent for 1997, 9.0 percent for 1998, and 8.9 percent for 1999 and is applied to the average harvest-time price for each crop. This interest rate is the average rate for all commercial agricultural loans for the third quarter of each year as reported in the *Agricultural Finance Databook* published by the Board of Governors of the Federal Reserve Board. The third quarter rate represents the interest opportunity costs at the end of harvest for a wheat producer. The interest charge for storing grain is the interest rate compounded daily from the end of harvest to the date of sale.²²

The calculation of carrying charges may be impacted by an advisory program's loan recommendations and/or the decision rules discussed in the previous section. Specifically, during the period wheat is placed under loan, interest costs are not accumulated, as the proceeds from the loan can be used to offset interest opportunity costs that otherwise would accumulate. This most commonly occurs after March 31, 1999, when it is assumed that all unpriced grain for which loan benefits have not been established is placed under loan until priced. If a crop is priced while under loan (the loan is assumed to be repaid on the same date), but stored beyond the time of pricing, interest opportunity costs are accumulated from the day of pricing until the time storage ceases.

Finally, it could be argued that interest opportunity costs should be charged based on the LDP available at harvest but not taken by an advisory program. This adjustment is not made for two reasons. First, it would not substantially impact the results due to the small interest opportunity costs involved. Second, anecdotal evidence suggests that there may be considerable delay in LDP payments actually reaching producers, with lags of several months apparently not uncommon.

Benchmark Prices

²² For example, the daily interest rate, r , for 1996 is computed as follows:

$$r = (1.086)^{\frac{1}{365}} - 1 = 0.0002261 \text{ or } 0.02261 \text{ percent per day .}$$

In addition to comparing the net price received across advisory programs, it is useful to compare the results to simple market benchmark prices. These prices are intended to provide information about the actual prices that are available for a particular crop, and provide an indication of how producers might fare using some basic marketing strategies that do not require professional marketing advice.

The development of an appropriate market benchmark for advisory service performance analysis is considered in a recent AgMAS research report.²³ In this report, it is argued that a useful benchmark should: i) be *simple* to understand and to calculate; ii) represent the returns to a marketing strategy that could be *implemented* by producers; iii) be directly *comparable* to the net advisory price received from following the recommendations of a market advisory program; iv) not be a function of the actual recommendations of the advisory programs or of the actual marketing behavior of producers, but rather should be *external* to their marketing activities; and v) be *stable*, so that it represents the range of prices made available by the market throughout the marketing period instead of representing the price during a small segment of the marketing period.

Three potential specifications are considered in the aforementioned research on market benchmarks for corn and soybeans: the average price received by farmers, the harvest cash price, and the average cash price over a two-year time span that extends from one year prior to harvest through one year after harvest. The average price received by farmers is reported by the USDA and is widely cited as a measure of the economic condition of the farm sector. It is not directly comparable to the net advisory price, however, because it includes quality discounts and premiums. The average price received also is a function of farmers' actual marketing behavior. The harvest cash price is straightforward and easy to calculate because production risk and storage costs are not included. However, in a given year, the harvest cash price may not represent the average price that is available to farmers for that crop.

The average cash price benchmark meets all of the selection criteria listed above, except it may not be easily implemented by producers since it involves marketing a small portion of each crop every day of the two-year marketing window. It is shown for corn and soybeans, though, that the price realized via a more manageable strategy of routinely selling twelve times during the marketing window very closely approximates the average cash price. Therefore, it is determined that the average cash price meets all five selection criteria and is the most appropriate market benchmark to be used in evaluating the pricing performance of market advisory programs. This benchmark is employed in the 1997 and 1998 AgMAS corn and soybean pricing evaluations.²⁴

²³Good, D.L., S.H. Irwin, and T.E. Jackson. "Development of a Market Benchmark Price for AgMAS Performance Evaluations," AgMAS Project Research Report 1998-02, December 1998.

²⁴ Jackson T.E., S.H. Irwin, and D.L. Good, "1997 Pricing Performance of Market Advisory Services for Corn and Soybeans." AgMAS Project Research Report 1999-01, February 1999.

Good D.L., S.H. Irwin, T.E. Jackson, M.A. Jirik, and J. Martinez-Filho, "1998 Pricing Performance of Market Advisory Services for Corn and Soybeans." AgMAS Project Research Report 2000-01, February 2000.

Consistent with AgMAS corn and soybean evaluations, the market benchmark price for wheat used in this study is the 24-month average cash price stated on a harvest equivalent basis. Using 1998 as an example, the benchmark is based on the average price over the 1998 marketing period, which began on June 1, 1997 and ended on May 31, 1999. Cash forward prices for West Southwest Illinois Price Reporting District are used during the pre-harvest period, while daily spot prices for the West Southwest Illinois Price Reporting District are used for the post-harvest period. The same forward and spot price series applied to advisory program recommendations are used to construct the benchmark. Details on the forward and cash price series can be found in the earlier “Prices” section of this report.

Four adjustments are made to the daily cash prices to make the average cash price benchmark consistent with the calculated net advisory prices for each marketing program. The first is to take a weighted average price, to account for changing yield expectations, instead of taking the simple average of the daily prices. This adjustment is consistent with the procedure described previously in the "Expected Yield" section. The daily weighting factors for pre-harvest prices are based on the calculated trend yield, while the weighting of the post-harvest prices is based on the actual reported yield for southwest Illinois. The second adjustment is to compute post-harvest cash prices on a harvest equivalent basis, which is done by subtracting carrying charges (storage and interest) from post-harvest spot cash prices. The daily carrying charges are calculated in the same manner as those for net advisory prices.

The third adjustment deals with the low yield in 1996. The benchmark expected yield is reduced due to the May USDA crop estimate triggering a short-crop adjustment of yield expectations. At the time of the USDA report release, the benchmark yield is reduced from 54 bpa to the USDA estimate of 41 bpa, then reduced again on the first day of harvest to the actual yield of 38 bpa.

The final adjustment to the average cash price benchmark is needed only for 1998 computations. In the context of evaluating advisory program recommendations, it was argued earlier that a “prudent” or “rational” producer would take advantage of the price protection offered by the loan program, even in the absence of specific advice from an advisory program. This same logic suggests that a “prudent” or “rational” producer will take advantage of the price protection offered by the loan program when following the benchmark average price strategy. Based on this argument, the average cash price benchmark is adjusted by the addition of LDPs and MLGs. Bushels marketed in the 1998 pre-harvest period according to the benchmark strategy (approximately 53 percent) are treated as forward contracts with the LDPs assigned at harvest. Bushels marketed in 1998 each day in the post-harvest period (approximately 47 percent) are awarded the LDP or MLG in existence for that particular day. Finally, just as in the case with comparable advisory program recommendations, interest opportunity costs are not charged to the benchmark after March 31, 1999 to reflect the assumption that stored grain is placed under loan.

Since performance results may be sensitive to the choice of market benchmark, Table 3 presents a comparison of alternative wheat market benchmarks for 1995 through 1998. The first

benchmark is the 24-month average cash price described above. The second benchmark averages prices for the 20-month period starting in October of the year previous to harvest and ending in May of the year after harvest. The only difference between this alternative and the 24-month benchmark is the exclusion of the pre-harvest period previous to October. Hence, the 20-month benchmark places more weight on post-harvest prices than pre-harvest prices. The third benchmark averages prices only for a 16-month marketing window, which excludes prices previous to February. The fourth benchmark is the harvest cash price, computed as the average daily cash price for the three-week harvest window.

For a given year, price varies considerably across market benchmarks. For example, the range from the highest to lowest benchmark in 1996 is sixty-six cents per bushel. However, there is no clear pattern in the variation of the benchmarks relative to one another. As a result, average benchmark prices are similar for the entire four-year period. The four-year averages for the three average cash price benchmarks differ by at most one cent. This is not surprising given the nature of the average cash price benchmarks. In informationally efficient markets, averages of different cash price benchmarks should be roughly similar when stated on a harvest equivalent basis. The 24-month benchmark demonstrates less year-to-year variation than the other two benchmarks, as reflected in the smaller standard deviation. The four-year average harvest cash price is thirteen to fourteen cents per bushel higher than the other benchmarks, likely due to the unusually high wheat prices during harvest 1996. This demonstrates the potential instability of the harvest cash price benchmark relative to average cash price benchmarks, particularly in small samples. Overall, these results indicate pricing performance evaluations are not likely to be overly sensitive to the choice of the 24-month average cash price benchmark.

As with previous studies for corn and soybeans, the major concern about using the 24-month benchmark is whether or not producers could actually achieve the benchmark. The outcomes for three mechanical marketing strategies were calculated and are presented in Table 3. The strategy of routinely selling an equal portion of the crop on the fifteenth of each month for the two-year marketing window reproduced the 24-month benchmark almost identically in each year of the study.

Pricing Performance Results for the Advisory Programs

Pricing performance results for the 1995, 1996, 1997 and 1998 wheat crops are presented in Tables 4 through 7 and Figures 9 through 16. For a specific example of how marketing recommendations are translated into a final net advisory price that incorporates similar parameters, please refer to the 1996 AgMAS Corn and Soybean Pricing Report.²⁵

²⁵Jackson, T.E., S.H. Irwin and D.L. Good. "1996 Pricing Performance of Market Advisory Services for Corn and Soybeans" AgMAS Project Research Report 1998-01, January 1998, pp. 10-13. This report is available on the AgMAS website (<http://web.aces.uiuc.edu/farm.doc/agmas/>).

Program-by-program results of the 1995 wheat evaluations are contained in Table 4. This table shows the breakout of the components of the net advisory price as well as the net advisory price itself. The average net advisory price for all 24 programs is \$3.79 per bushel. It is computed as the unadjusted cash sales price (\$4.11 per bushel) minus carrying charges (\$0.18 per bushel) plus futures and options gains (-\$0.12 per bushel) minus brokerage costs (\$0.01 per bushel).²⁶ The net advisory price is eighteen cents above the market benchmark price. The range of net advisory prices is large, with a minimum of \$3.01 per bushel and a maximum of \$4.71 per bushel.

Program-by-program results of the 1996 wheat evaluations are contained in Table 5. The average net advisory price for all 23 programs is \$3.82 per bushel. It is computed as the unadjusted cash sales price (\$4.15 per bushel) minus carrying charges (\$0.23 per bushel) plus futures and options gains (-\$0.08 per bushel) minus brokerage costs (\$0.01 per bushel).²⁶ The net advisory price is thirteen cents below the market benchmark price. The range of net advisory prices for 1996 increased as compared to 1995, with a minimum of \$2.74 per bushel and a maximum of \$4.94 per bushel.

Program-by-program results of the 1997 evaluations are contained in Table 6. The average net advisory price for the 20 programs is \$2.64 per bushel. It is computed as the unadjusted cash sales price (\$3.04 per bushel) minus carrying charges (\$0.45 per bushel) plus futures and options gains (\$0.06 per bushel) minus brokerage costs (\$0.02 per bushel).²⁶ The net advisory price is fifty-eight cents per bushel below the market benchmark price. The range of net advisory prices for 1997 increases as compared to both 1995 and 1996, with a minimum of \$1.34 per bushel and a maximum of \$3.90 per bushel.

Finally, program-by-program results of the 1998 evaluation are contained in Table 7. The average net advisory price for the 21 programs is \$2.36 per bushel. It is computed as the unadjusted cash sales price (\$2.46 per bushel) minus carrying charges (\$0.37 per bushel) plus futures and options gains (\$0.09 per bushel) minus brokerage costs (\$0.02 per bushel) plus LDP/MLG gain (\$0.20 per bushel). The net advisory price is fifty-four cents per bushel below the market benchmark price. The range of net advisory prices for 1998 decreased somewhat compared to 1996 and 1997, with a minimum of \$1.34 per bushel and a maximum of \$3.33 per bushel.

A point to consider when examining Tables 4, 5, 6 and 7 is the impact of the assumption that all storage occurs off-farm. It is possible to argue that short-run marginal costs of on-farm wheat storage are zero if the facilities already exist and variable costs associated with handling wheat and maintaining grain quality are not included. Excluding the costs of commercial storage entirely (but continuing to subtract interest costs), the average net advisory price increases to \$3.88²⁷ per bushel in 1995, \$3.94 in 1996, \$2.90 in 1997, and \$2.59 per bushel in 1998. The

²⁶ The components do not sum exactly to the average net advisory price due to rounding.

²⁷ For example, using Table 4, this alternative price is computed as,

\$3.88 per bushel = \$3.79 (average net advisory price) + \$0.09 (average advisory storage cost)

calculation of the market benchmark price also is impacted by such a change in the storage cost assumption. The market benchmark price increases to \$3.66 per bushel for 1995, \$3.99 for 1996, \$3.31 for 1997 and \$2.97 per bushel for 1998. Therefore, if physical storage charges are assumed to be zero, the average net advisory price would be \$0.22 above the market benchmark price for 1995, \$0.05 under for 1996, \$0.41 under for 1997, and \$0.38 under for 1998.

The distribution of the net advisory prices is illustrated in Figures 9, 10, 11 and 12. For the 24 wheat programs for 1995, four achieve a net price that is within (plus or minus) \$0.20 of the market benchmark price of \$3.61 per bushel. Ten of the advisory programs achieve a net price \$0.21 to \$0.61 higher than the market benchmark price, two programs achieve a net price of \$0.62 to \$1.02 above the market benchmark and one program beats the benchmark price by more than \$1.03. Seven programs are grouped in a range between \$0.21 and \$0.61 below the market benchmark price.

For the 23 wheat programs in the 1996 evaluation, eleven are within (plus or minus) \$0.25 per bushel of the market benchmark price of \$3.95 per bushel. Three of the advisory programs achieve a net price between \$0.26 and \$0.76 higher than the market benchmark price, and one program achieves a net price of more than \$0.77 above the market benchmark. Four programs are grouped in a range between \$0.26 and \$0.76 below the market benchmark price, with four programs more than \$0.77 below the market benchmark.

For the 20 wheat programs for 1997 wheat, five achieve a net price that is within (plus or minus) \$0.25 of the market benchmark price of \$3.22 per bushel. Two of the advisory programs achieve a net price \$0.26 or higher than the market benchmark price. Four programs are grouped in a range between \$0.26 and \$0.76 below the market benchmark price, seven services are in a range between \$0.77 and \$1.27 below the benchmark, one service is in a range between \$1.28 and \$1.78 below the benchmark price, and one service is in a range between \$1.79 and \$2.29 below the benchmark price.

For the 21 wheat programs in the 1998 evaluation, four are within (plus or minus) \$0.23 per bushel of the market benchmark price of \$2.90 per bushel. One of the advisory programs achieves a net price between \$0.24 and \$0.70 higher than the market benchmark price. Nine programs are grouped in a range between \$0.24 and \$0.70 below the market benchmark price, with six programs in a range from \$0.71 to \$1.17 below the market benchmark, and one program that is more than \$1.18 below the benchmark.

Another view of the pricing performance of the advisory programs is shown in Figures 13, 14, 15, and 16. Here, net advisory prices are ranked from highest to lowest and plotted versus the market benchmark. Sixteen of the 24 wheat marketing programs in 1995 achieve a net price that is equal to or higher than the market benchmark price. Nine wheat marketing programs beat the market benchmark in 1996. Four programs beat the benchmark in 1997 and one service outperforms the market benchmark in 1998. Note that the same advisory programs do not necessarily exceed the market benchmarks in each of the comparisons in Figures 13, 14, 15, and 16.

Figure 17 shows the pattern of wheat prices for the 1995 marketing window. The top chart shows daily cash prices from June 1, 1994 through May 31, 1996. The pre-harvest prices are the forward contract prices for harvest delivery. The second chart offers a different perspective, in that during the post-harvest period the daily cash price is adjusted for cumulative carrying costs (interest and storage charges). This shows that prices for the 1995 crop are highest in the post-harvest period with prices reaching well over \$5.50 in late April and early May of 1996. This is due to a lower than trend yield for 1995 and the realization that 1996 is also going to be a low yielding year. While some advisory services sold early in the crop year, many held the crop and captured the high April and May prices.

Figure 18 shows the pattern of wheat prices for the 1996 marketing year from June 1, 1995 to May 31, 1997. Again, the first chart shows the price series with the pre-harvest forward contract and the post-harvest cash price, while the second graph incorporates the cost of carry. This shows the increasing cash price as low yields expectations pushed the pre-harvest cash price over \$5.50, then the decline to the \$3.50 level as the potential for the 1997 crop is finally realized in late May. The same 1996 high in April and May that created an opportunity for those holding the 1995 crop also spurred some advisory services to forward contract expected 1996 production.

Figure 19 shows the effects of a large crop hitting the marketplace. Forward contract bids reflected the low yields of the 1996 harvest, but prices dipped below \$3.00 by August 1997. The situation worsens as the full impact of the Asian economic situation begins to slow exports throughout the second half of the 1997 marketing period. Unfortunately, many advisors held wheat, perhaps hoping for an end of the year windfall such as in 1995. However, the potential for good yields in all classes for 1998 causes prices to decline further.

Figure 20 incorporates the LDP and MLG rates for the 1998 marketing period. The first graph shows the pre-harvest bids and then the post-harvest cash price. The middle graph shows the impact of the LDP and MLG on the net price available to producers. The third graph shows the impact of both LDP and carry on the market. There are good pricing opportunities prior to harvest, with bids at some times above \$3.50. However, a trend line yield for soft red winter wheat and larger than trend for hard red winter and hard red spring wheat, coupled with lower than anticipated exports, results in prices below the loan rate for most of the remainder of the marketing period. LDPs and MLGs are minimal at harvest, but increase as harvest progresses in the hard red winter and hard red spring wheat areas, at times reaching over \$0.60. Those advisors who chose forward contracting are rewarded as prices continue to slide. Some of the services chose to speculate on the LDP as it appeared to disappear during corn and soybean harvest, only to see prices sink to new lows, and no chance of even receiving the loan rate for wheat.

Average Pricing Performance Results for the Advisory Programs

A summary of the results of the pricing performance evaluations for the 1995, 1996, 1997 and 1998 wheat marketing periods is contained in Tables 8 and 9 and Figures 21 through 23. Tables 8 and 9 present pricing results for each year along with two-year averages (1997-1998),

three-year averages (1996-1998) and four-year averages (1995-1998).²⁸ Some marketing programs are not included in all of the averages. For example, four-year averages are calculated only for the 18 marketing programs that are evaluated for all four years. The following discussion focuses on the four-year average results.

As shown in Table 8, the average net advisory wheat price over the four years for the 18 programs is \$3.15 per bushel, \$0.27 below the four-year market benchmark price of \$3.42 per bushel. The results range from a low of \$2.76 to a high of \$3.48 per bushel.

The four-year results for advisory wheat revenue are presented in Table 9. At first glance, revenue results appear to be redundant with the net price results. However, annual yield variation may cause average revenue and average price results to differ across services. In particular, the impact of the relatively good and poor pricing performance may be reduced or exaggerated depending on whether it is associated with large or small wheat crops. The average advisory revenue for the four years is \$151 per acre. This is \$16 per acre lower than the four-year market benchmark revenue. The results range from \$134 to \$172 per acre.

For comparison purposes, the annual subscription cost of each advisory program also is listed in Table 9. Subscription costs average \$294 per program, about twice the average advisory revenue for one acre of production. Subscription costs do not appear to be large relative to total farm revenue, whether a large or small farm is considered. For a 1,000 acre farm, subscription costs average about two-tenths of one percent of total advisory revenue. For a 250 acre farm, subscription costs average about eight-tenths of one percent of total advisory revenue. Note that subscription costs are not subtracted from the revenue figures presented in Table 9.

As shown in the top chart in Figure 23, only 2 of the 18 wheat-marketing programs achieve a four-year average net advisory price that is above the four-year average market benchmark price of \$3.42 per bushel. The bottom chart in Figure 23 shows the comparison of the four-year average advisory revenue versus the four-year average revenue implied by the market benchmark price. Two of the 18 advisory programs achieve a four-year average revenue that is above average market benchmark revenue of \$167 per acre.

A First Look at Pricing Performance and Risk of the Advisory Programs

An advisory program's net price received is an important indicator of performance. However, pricing performance almost certainly is not the only relevant indicator. For example, two advisory programs may generate the same average net price across marketing periods, but the risk of the programs may differ substantially. The difference in risk may be the result of: i) type of recommended pricing tool (cash, cash forward, futures, options, etc.); ii) timing of sales; and iii) implementation of marketing strategies.

²⁸ In this section and the next, terms like "two-year average" are used to refer to averages of net advisory prices over multiple marketing periods.

In order to quantify the risk of advisory programs, a definition of risk must be developed. Risk is usually thought of as the possibility or probability of loss. A natural extension of this idea looks at risk as the chance producers will fail to achieve the net price they expect based on following an advisory program. This approach to quantifying risk does not measure the possibility of loss alone. Risk is seen as uncertainty – the likelihood that what is expected will fail to happen, whether the outcome is better or worse than expected. So an unexpected return on the upside or the downside – a net price of \$3.50 or \$2.50 per bushel when a net price of \$3.00 per bushel is expected – counts in determining the “risk” of an advisory program. Thus, an advisory program whose net price does not depart much from its expected, or average, net price is said to carry little risk. In contrast, an advisory program whose net price is quite volatile from year-to-year, often departing from expected net price, is said to be quite risky.

This approach to defining risk can be quantified by using a statistical measure called the standard deviation.²⁹ It measures the dispersion of year-to-year net advisory prices from the average net price. One can think of the standard deviation as the “typical” variation in net price from year-to-year. The larger the standard deviation of an advisory program, the less likely a producer is to get exactly the net price expected, though it is possible by chance to get a higher price instead of a lower one for any particular time period.

Separate analysis of market advisory pricing performance and risk will provide valuable information to producers. However, as economic theories of decision-making under risk highlight, it is the tradeoff between pricing performance and risk that is likely to be of greatest interest to producers.³⁰ Theory suggests that above-average pricing performance should be possible only if marketing strategies are recommended that have above-average risk (and *vice versa*). Faced with such a choice set, producers will choose an advisory program that has a pricing-risk tradeoff that is consistent with their risk preferences.³¹

The basic data needed for assessing the pricing-risk tradeoff of market advisory programs is presented in Table 10. For each advisory program tracked in all four years of AgMAS evaluations, the four-year average and standard deviation of net price or revenue is reported. The standard deviations indicate that the risk of advisory programs varies substantially. In wheat, the standard deviations range from a low of \$0.20 per bushel to a high of \$1.70 per bushel. The average standard deviation across the 18 wheat programs is \$0.86 per bushel, which is substantially higher than the \$0.46 per bushel standard deviation of the wheat market benchmark.

²⁹ For a given advisory program, the formula for standard deviation is,

$$\hat{\sigma} = \sqrt{\frac{1}{T-1} \sum_{t=1}^T (y_t - \bar{y})^2}$$

where T is the number of years in the sample, y_t is the advisory program’s net price for the t^{th} year and \bar{y} is the average net advisory price over the T years.

³⁰ Ingersoll, J. *Theory of Financial Decision Making*. Roman and Littlefield: Savage, Maryland, 1987.

³¹ A good non-technical introduction to measuring risk and performance in a return-risk framework can be found in: B.G. Malkiel. *A Random Walk Down Wall Street*. W.W. Norton & Company: New York, New York, 1999.

Finally, revenue standard deviations for the 18 programs range from a low of \$16 per acre to a high of \$58 per acre. The average revenue standard deviation across the 18 programs is \$33 per bushel, which is somewhat higher than the \$29 per acre standard deviation of the market benchmark. The smaller difference in the standard deviations for revenue is due to the fact that the advisory services as a whole did much better in short crop years compared to large crop years. Therefore, when price performance is multiplied by yield, the standard deviation is not as large because a high price is multiplied by a low yield and a low price is multiplied by a high yield, resulting in less variation.

The estimated relationship between pricing performance and risk for wheat is presented in Figure 24. Contrary to what economic theory predicts, there is a negative tradeoff between the average price and standard deviation; securing a higher net wheat price generally requires that an advisory program take on less risk, and *vice versa*. The strength of the relationship is measured by the correlation coefficient, which can take on values between -1 and $+1$. A negative value means that net price and standard deviation tend to move in opposite directions, while a positive value means they tend to move in the same direction. The closer a correlation coefficient is to -1 or $+1$, the stronger the tendency. Since the estimated correlation coefficient for wheat is -0.26 , a modestly negative relationship is indicated.

The performance implications for wheat of the tradeoff between pricing performance and risk are explored in Figure 25. The chart is the same as in Figure 24, except it is now divided into four quadrants based on the average price and standard deviation of the market benchmark. Advisory programs in the upper left quadrant have a higher price and less risk than the benchmark, which is the most desirable outcome from a producer's perspective. Advisory programs in the lower right quadrant have a lower price and more risk than the benchmark, which is the least desirable outcome from a producer's perspective. The two remaining quadrants reflect either a higher price and more risk than the market benchmark or a lower price and less risk than the market benchmark. A producer may prefer an advisory program to the market benchmark in either of these two quadrants, but this depends on personal preference for risk relative to return.

The data plotted in Figure 25 show there is only one advisory program in wheat that generates a combination of net price and risk superior to the market benchmark (upper left quadrant). In contrast, fifteen advisory programs in wheat produce a combination that is inferior to the benchmark (lower right quadrant). Only one program has a lower price and less risk than the benchmark, while one program has a higher price and more risk.

The estimated relationship between performance and risk for wheat revenue is presented in Figure 26. There is a slightly negative tradeoff between the average revenue and standard deviation. The estimated correlation coefficient for revenue is $+0.03$, indicating a neutral relationship between average revenue and risk.

Based on revenue, the data plotted in Figure 27 show that no advisory program generates a combination of average revenue and risk superior to the market benchmark (upper left quadrant). Eleven advisory programs produce a revenue combination that is inferior to the

benchmark (lower right quadrant). Five programs have lower revenue and less risk than the benchmark, while two programs have higher revenue and more risk.

Previous research on financial investments suggests that return-risk results, like those presented above, may be sensitive to alternative specifications of the market benchmark. To investigate this issue, the pricing (or revenue) performance and risk of market advisory programs is compared to the 20-month average cash price benchmark discussed earlier in the “Benchmark Prices” section. These results are found in Figures 28 through 31. Compared to the 24-month benchmark, the 20-month benchmark simply deletes the first four months of each marketing window from the computations of the benchmark price. The change barely impacts the average benchmark price or revenue for the four years of analysis. As noted earlier, this is not surprising given the nature of the average cash price benchmarks. In informationally efficient markets, annual averages of different average cash price benchmarks should be roughly similar when stated on a harvest equivalent basis. The same logic does not necessarily carry over to the standard deviations of the alternative benchmarks. In this case, standard deviations for the 20-month benchmark are higher than those of the 24-month benchmark (see Table 3). The higher standard deviations for the 20-month benchmark do make sense, given that the 20-month benchmark includes less pre-harvest forward contracting than the 24-month benchmark. It is interesting to note that the standard deviation for revenue is only slightly higher for the 20-month benchmark.

The comparisons in Figures 28 through 31 indicate that the risk-return performance of market advisory programs is not very sensitive to the change in market benchmarks. Figure 28 shows that there is still a negative correlation between price and standard deviation, though slightly less negative than that using the 24-month benchmark. Figure 29 shows there are five services that have lower price and lower risk and only 11 that have a lower price and higher risk. Figure 28 and 29 show that there is some sensitivity to the benchmark. However, Figure 30 and 31 show that there is much less sensitivity in revenue, in that the only change in either graph is a slight change in the correlation in Figure 30.

While there may be some sensitivity of the return-risk results to alternative benchmarks, it is important to emphasize that the basic findings are unchanged. Whether a 24-month or 20-month benchmark is considered, about two-thirds of the advisory programs generate average prices and risk in the low price/high risk quadrants. Contrary to theory, over this four-year period, taking a higher risk did not necessarily lead to high prices and vice versa.

The results presented in this section suggest performance analysis is little affected by the inclusion of risk. Whether one-dimension of performance, average price, or two-dimensions, average price and risk, are considered, the implications of the results are similar. Specifically, few wheat advisory programs “beat the market.” This overall conclusion is not sensitive to the benchmark used in this analysis.

It is important to emphasize at this point that the pricing and risk performance results are based on only four observations. This is a small sample for estimating the true risks of market

advisory programs. Hence, the results presented in this section should be viewed as exploratory rather than definitive.

Finally, the approach to performance evaluation presented in this section opens the door to a new type of analysis. Modern Portfolio Theory (MPT) shows how to combine market advisory programs into “portfolios” that have the highest return for a given level of risk. A “portfolio” might consist of 50 percent of wheat marketed by advisory program *X* and 50 percent marketed by advisory program *Y*. MPT produces “efficient portfolios” by taking advantage of the diversification opportunities available through combining advisory programs. In fact, it is possible that some portfolios of advisory programs will generate higher prices and less risk than the market benchmark (lie in the upper left quadrant of Figures 25 or 27), even though the individual advisory programs that make up the portfolio do not. The potential improvement in performance depends on the degree to which net advisory prices do *not* tend to move together. The application of MPT to market advisory services represents an interesting area of future research for the AgMAS Project.

Table 1. A Comparison of Yields and Deviation from Trend Yields in Illinois, Kansas, and South Dakota, 1995 - 1998

Year	West Southwest Illinois Soft Red Winter		Southwest Kansas Hard Red Winter		Northeast South Dakota Hard Red Spring	
	Yield	Deviation From Trend	Yield	Deviation From Trend	Yield	Deviation From Trend
	---bushels/acre---		---bushels/acre---		---bushels/acre---	
1995	45	-7.20	22	-14.93	35	1.64
1996	38	-14.74	26	-11.27	41	6.20
1997	65	11.70	37	-0.61	32	-3.26
1998	51	-2.85	51	13.04	35	-0.64

Note: Trend yield is based on a regression using data from 1972 through 1998.

Table 2. Linear Model of 1998 Wheat Harvest Progress in Illinois and Associated Loan Deficiency Payment (LDP)

Date	Harvest Progress Through Date	LDP on Date	Average LDP Through Date
	---percent---	---\$/bu.---	---\$/bu.---
06/18/1998	6.7	0.06	0.06
06/19/1998	13.3	0.05	0.05
06/22/1998	20.0	0.00	0.04
06/23/1998	26.7	0.00	0.03
06/24/1998	33.3	0.00	0.02
06/25/1998	40.0	0.00	0.02
06/26/1998	46.7	0.00	0.02
06/29/1998	53.3	0.08	0.02
06/30/1998	60.0	0.19	0.04
07/01/1998	66.7	0.13	0.05
07/02/1998	73.3	0.19	0.06
07/03/1998	80.0	0.19	0.07
07/06/1998	86.7	0.24	0.09
07/07/1998	93.3	0.20	0.09
07/08/1998	100.0	0.15	0.10

Note: Progress reported for entire state, as regional Illinois harvest progress data for wheat is unavailable.

Table 3. Comparison of Alternative Market Benchmarks and Mechanical Strategies, Wheat, 1995-1998

	1995	1996	1997	1998	1995-1998	Standard
Market Benchmark / Strategy	Price	Price	Price	Price	Average	Deviation
	---\$/bushel---					
	Market Benchmarks					
24-Month	3.61	3.95	3.22	2.90	3.42	0.46
20-Month	3.76	4.07	3.12	2.75	3.43	0.60
16-Month	3.96	4.07	3.09	2.54	3.42	0.73
Harvest Cash Price	4.01	4.61	3.03	2.57	3.56	0.92
	Mechanical Strategies					
Strategy 1	3.60	3.97	3.23	2.88	3.42	0.47
Strategy 2	3.74	4.10	3.13	2.73	3.43	0.61
Strategy 3	3.94	4.14	3.09	2.52	3.42	0.75

Note: Strategy 1 is selling on the 15th (or the nearest business day before the 15th) of each month one year prior to harvest and one year following harvest; Strategy 2 is selling on the 15th (or the nearest business day before the 15th) of each month eight months prior to harvest and one year after harvest; Strategy 3 is selling on the 15th (or the nearest business day before the 15th) of each month for one year after harvest.

Table 4. Pricing Performance Results for 24 Market Advisory Service Programs, Wheat, 1995 Marketing Period

Market Advisory Program	(1)	(2) Carrying Charges		(4)	(5)	(6)	(7)
	Unadjusted Cash Sales Price	Interest Costs	Storage Costs	Net Cash Sales Price	Futures & Options Gain	Brokerage Costs	Net Advisory Price
				---\$/bushel---			
Ag Line by Doane (cash-only)	4.21	0.04	0.06	4.11	0.00	0.00	4.11
Ag Profit by Hjort Associates	4.84	0.14	0.15	4.54	0.00	0.00	4.54
Ag Resource	4.14	0.13	0.12	3.88	0.36	0.03	4.21
Ag Review	4.30	0.07	0.09	4.14	0.61	0.03	4.71
Agri-Edge (cash-only)	4.20	0.09	0.10	4.01	0.00	0.00	4.01
Agri-Edge (hedge)	4.10	0.09	0.10	3.92	0.06	0.01	3.98
Agri-Visor Aggressive Cash	3.66	0.09	0.09	3.48	-0.25	0.02	3.21
Agri-Visor Aggressive Hedge	4.84	0.15	0.16	4.54	-0.50	0.03	4.00
Agri-Visor Basic Cash	3.86	0.09	0.09	3.68	-0.65	0.01	3.03
Agri-Visor Basic Hedge	4.84	0.15	0.16	4.54	-0.60	0.03	3.91
Allendale (futures only)	4.86	0.16	0.17	4.54	-1.22	0.00	3.32
Brock (cash-only)	3.45	0.00	0.00	3.45	0.00	0.00	3.45
Brock (hedge)	3.45	0.00	0.00	3.45	-0.08	0.03	3.33
Freese-Notis	3.81	0.04	0.05	3.72	-0.06	0.00	3.66
Grain Field Report	3.65	0.01	0.02	3.62	0.18	0.01	3.79
Harris Weather/Elliott Advisory	4.38	0.07	0.10	4.21	-0.08	0.01	4.11
North American Ag.	5.36	0.30	0.28	4.77	-0.58	0.01	4.19
Pro Farmer (cash only)	4.18	0.12	0.13	3.93	0.00	0.00	3.94
Pro Farmer (hedge)	4.21	0.10	0.11	4.00	0.39	0.01	4.38
Prosperous Farmer	3.57	0.00	0.00	3.57	-0.24	0.03	3.30
Stewart-Peterson Advisory Reports	3.70	0.06	0.07	3.57	-0.17	0.04	3.34
Stewart-Peterson Strictly Cash	3.77	0.07	0.07	3.63	0.00	0.00	3.63
Top Farmer Intelligence	3.28	0.04	0.03	3.21	-0.16	0.03	3.01
Zwicker Cycle Letter	4.04	0.07	0.07	3.89	0.00	0.00	3.89
<i>Descriptive Statistics:</i>							
<i>Average</i>	4.11	0.09	0.09	3.93	-0.12	0.01	3.79
<i>Median</i>	4.12	0.08	0.09	3.90	-0.03	0.01	3.90
<i>Minimum</i>	3.28	0.00	0.00	3.21	-1.22	0.00	3.01
<i>Maximum</i>	5.36	0.30	0.28	4.77	0.61	0.04	4.71
<i>Range</i>	2.08	0.30	0.28	1.56	1.82	0.04	1.70
<i>Standard Deviation</i>	0.53	0.07	0.06	0.42	0.38	0.01	0.47
Market Benchmark Price	3.72	0.06	0.05	3.61	0.00	0.00	3.61

Notes: Net cash sales price is calculated as (1) - (2) - (3). Net advisory price is calculated as (4) + (5) - (6), and therefore, is stated on a harvest equivalent basis. The market benchmark price is stated on a harvest equivalent basis. The market benchmark price is the average daily cash price for the two-year marketing window from June 1994 through May 1996.

Table 5. Pricing Performance Results for 23 Market Advisory Service Programs, Wheat, 1996 Marketing Period

Market Advisory Program	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Unadjusted Cash Sales Price	Carrying Interest Costs	Storage Costs	Net Cash Sales Price	Futures & Options Gain	Brokerage Costs	Net Advisory Price
				--\$/bushel--			
Ag Line by Doane (cash-only)	4.58	0.05	0.05	4.47	0.00	0.00	4.47
Ag Profit by Hjort Associates	4.31	0.12	0.11	4.08	0.00	0.00	4.08
Ag Resource	5.04	0.05	0.05	4.94	0.00	0.00	4.94
Ag Review	4.14	0.18	0.16	3.79	-0.16	0.03	3.60
Agri-Edge (cash only)	3.60	0.32	0.30	2.98	0.00	0.00	2.98
Agri-Edge (hedge)	3.75	0.22	0.22	3.31	-0.18	0.03	3.11
Agri-Visor Aggressive Cash	4.32	0.08	0.08	4.16	-0.12	0.02	4.03
Agri-Visor Aggressive Hedge	4.33	0.08	0.08	4.17	0.04	0.03	4.18
Agri-Visor Basic Cash	4.13	0.12	0.12	3.89	0.03	0.01	3.91
Agri-Visor Basic Hedge	4.39	0.08	0.08	4.24	-0.38	0.01	3.84
Allendale (futures only)	3.75	0.00	0.00	3.75	-0.80	0.02	2.95
Brock (cash-only)	4.07	0.04	0.04	3.99	0.00	0.00	3.99
Brock (hedge)	4.38	0.00	0.00	4.38	-0.58	0.04	3.76
Freese-Notis	4.42	0.00	0.00	4.42	0.00	0.00	4.42
Grain Field Report	3.88	0.13	0.13	3.61	-0.01	0.00	3.60
Harris Weather/Elliott Advisory	3.85	0.21	0.20	3.45	0.22	0.02	3.65
Pro Farmer (cash-only)	4.27	0.10	0.08	4.09	0.00	0.00	4.09
Pro Farmer (hedge)	4.48	0.19	0.16	4.13	-0.34	0.02	3.76
Progressive Ag	4.18	0.08	0.09	4.01	0.30	0.03	4.29
Stewart-Peterson Advisory Reports	4.11	0.11	0.11	3.89	-0.01	0.04	3.85
Stewart-Peterson Strictly Cash	4.07	0.09	0.09	3.90	0.00	0.00	3.90
Top Farmer Intelligence	3.88	0.17	0.17	3.55	0.05	0.01	3.60
Zwicker Cycle Letter	3.41	0.36	0.31	2.74	0.00	0.00	2.74
<i>Descriptive Statistics:</i>							
<i>Average</i>	4.15	0.12	0.11	3.91	-0.08	0.01	3.82
<i>Median</i>	4.14	0.10	0.09	3.99	0.00	0.01	3.85
<i>Minimum</i>	3.41	0.00	0.00	2.74	-0.80	0.00	2.74
<i>Maximum</i>	5.04	0.36	0.31	4.94	0.30	0.04	4.94
<i>Range</i>	1.63	0.36	0.31	2.20	1.10	0.04	2.20
<i>Standard Deviation</i>	0.36	0.09	0.08	0.49	0.24	0.01	0.52
<i>Market Benchmark Price</i>	4.04	0.04	0.04	3.95	0.00	0.00	3.95

Notes: Net cash sales price is calculated as (1) - (2) - (3). Net advisory price is calculated as (4) + (5) - (6), and therefore, is stated on a harvest equivalent basis. The market benchmark price is stated on a harvest equivalent basis. The market benchmark price is the average daily cash price for the two-year marketing window from June 1995 through May 1997.

Table 6. Pricing Performance Results for 20 Market Advisory Service Programs, Wheat, 1997 Marketing Period

Market Advisory Program	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Unadjusted Cash Sales Price	Carrying Interest Costs	Storage Costs	Net Cash Sales Price	Futures & Options Gain	Brokerage Costs	Net Advisory Price
	---\$/bushel---						
Ag Line by Doane (cash-only)	3.14	0.12	0.17	2.85	0.00	0.00	2.85
Ag Profit by Hjort Associates ¹	2.35	0.26	0.55	1.54	0.00	0.00	1.75
Ag Resource	3.08	0.18	0.23	2.66	-1.25	0.07	1.34
Ag Review	2.51	0.36	0.48	1.67	0.32	0.02	1.97
Agri-Visor Aggressive Cash	2.73	0.24	0.29	2.20	0.00	0.00	2.20
Agri-Visor Aggressive Hedge	2.73	0.24	0.29	2.20	0.00	0.00	2.20
Agri-Visor Basic Cash	2.73	0.24	0.29	2.20	0.00	0.00	2.20
Agri-Visor Basic Hedge	2.73	0.24	0.29	2.20	0.00	0.00	2.20
Allendale (futures only) ²	2.43	0.86	1.05	0.52	2.70	0.14	3.09
Brock (cash-only)	3.46	0.05	0.08	3.32	0.00	0.00	3.32
Brock (hedge)	3.44	0.04	0.08	3.32	0.19	0.01	3.49
Freese-Notis	3.41	0.07	0.10	3.23	0.00	0.00	3.23
Pro Farmer (cash-only)	3.18	0.13	0.18	2.87	0.00	0.00	2.87
Pro Farmer (hedge)	3.22	0.12	0.17	2.93	-0.09	0.01	2.83
Progressive Ag	3.34	0.11	0.15	3.09	-0.63	0.04	2.42
Stewart-Peterson Advisory Reports	3.37	0.09	0.13	3.14	-0.13	0.03	2.98
Stewart-Peterson Strictly Cash	3.32	0.07	0.10	3.15	0.00	0.00	3.15
Top Farmer Intelligence	3.00	0.20	0.28	2.52	0.08	0.05	2.55
Utterback	3.86	0.00	0.00	3.86	0.09	0.05	3.90
Zwicker Cycle Letter	2.73	0.24	0.29	2.20	0.00	0.00	2.20
<i>Descriptive Statistics:</i>							
<i>Average</i>	3.04	0.19	0.26	2.58	0.06	0.02	2.64
<i>Median</i>	3.11	0.16	0.21	2.76	0.00	0.00	2.69
<i>Minimum</i>	2.35	0.00	0.00	0.52	-1.25	0.00	1.34
<i>Maximum</i>	3.86	0.86	1.05	3.86	2.70	0.14	3.90
<i>Range</i>	1.51	0.86	1.05	3.34	3.95	0.14	2.56
<i>Standard Deviation</i>	0.40	0.18	0.23	0.77	0.70	0.04	0.64
Market Benchmark Price	3.38	0.06	0.09	3.22	0.00	0.00	3.22

Notes: Net cash sales price is calculated as (1) - (2) - (3). Net advisory price is calculated as (4) + (5) - (6), and therefore, is stated on a harvest equivalent basis. The market benchmark price is stated on a harvest equivalent basis. The market benchmark price is the average daily cash price for the two-year marketing window from June 1996 through May 1998.

¹ Ag Profit by Hjort Associates made explicit recommendations to place the enter 1997 wheat crop into the CCC marketing loan program. This resulted in a marketing loan gain of 21 cents, which is added to the net cash sales prices to arrive at the final net advisory price.

² At the time of analysis for this report, Allendale (futures only) had not made any cash sales of 1997 wheat. However, the crop is fully hedged using wheat futures. In order to complete the analysis, the futures positions are closed and all remaining cash quantities sold as of May 31, 2000. Future AgMAS pricing reports will update and revise results for this program when the final pricing decisions are made.

Table 7. Pricing Performance Results for 21 Market Advisory Service Programs, Wheat, 1998 Marketing Period

Market Advisory Program	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unadjusted Cash Sales Price	Carrying Interest Costs	Charges Storage Costs	Net Cash Sales Price	Futures & Options Gain	Brokerage Costs	LDP/ MLG Gain	Net Advisory Price
				---\$/bushel---				
Ag Line by Doane (cash-only)	2.40	0.14	0.23	2.03	0.00	0.00	0.02	2.05
Ag Line by Doane (hedge)	2.24	0.16	0.25	1.82	0.17	0.00	0.02	2.01
Ag Profit by Hjort Associates ¹	2.43	0.42	0.68	1.33	0.00	0.00	0.02	1.34
Ag Resource	2.21	0.05	0.11	2.05	-0.37	0.03	0.46	2.13
Ag Review	2.31	0.12	0.21	1.98	0.20	0.01	0.08	2.25
Agri-Visor Aggressive Cash	2.41	0.12	0.19	2.10	0.00	0.00	0.17	2.27
Agri-Visor Aggressive Hedge	2.41	0.12	0.19	2.10	-0.08	0.02	0.09	2.09
Agri-Visor Basic Cash	2.39	0.13	0.20	2.06	0.00	0.00	0.09	2.15
Agri-Visor Basic Hedge	2.39	0.13	0.20	2.06	-0.08	0.02	0.09	2.05
Allendale (futures only) ²	2.43	0.45	0.68	1.30	1.36	0.09	0.09	2.65
Brock (cash-only)	2.52	0.07	0.13	2.32	0.00	0.00	0.46	2.77
Brock (hedge)	2.67	0.02	0.06	2.59	0.33	0.05	0.46	3.33
Freese-Notis	2.61	0.09	0.16	2.36	0.00	0.00	0.18	2.54
Pro Farmer (cash-only)	2.35	0.14	0.23	1.98	0.00	0.00	0.42	2.40
Pro Farmer (hedge)	2.35	0.14	0.23	1.98	0.09	0.02	0.42	2.47
Progressive Ag	2.43	0.01	0.04	2.38	-0.22	0.02	0.39	2.54
Stewart-Peterson Advisory Reports	2.63	0.06	0.11	2.46	0.08	0.03	0.11	2.62
Stewart-Peterson Strictly Cash	2.74	0.07	0.13	2.54	0.00	0.00	0.17	2.71
Top Farmer Intelligence	2.28	0.32	0.51	1.45	0.71	0.09	0.17	2.23
Utterback	3.00	0.00	0.00	3.00	-0.26	0.05	0.10	2.79
Zwicker Cycle Letter	2.42	0.12	0.19	2.11	-0.04	0.02	0.17	2.22
<i>Descriptive Statistics:</i>								
<i>Average</i>	2.46	0.14	0.23	2.09	0.09	0.02	0.20	2.36
<i>Median</i>	2.41	0.12	0.19	2.06	0.00	0.02	0.17	2.27
<i>Minimum</i>	2.21	0.00	0.00	1.30	-0.37	0.00	0.02	1.34
<i>Maximum</i>	3.00	0.45	0.68	3.00	1.36	0.09	0.46	3.33
<i>Range</i>	0.79	0.45	0.68	1.70	1.73	0.09	0.44	1.99
<i>Standard Deviation</i>	0.18	0.12	0.18	0.41	0.36	0.03	0.16	0.40
<i>Market Benchmark Price</i>	2.87	0.04	0.07	2.76	0.00	0.00	0.13	2.90

Notes: Net cash sales price is calculated as (1) - (2) - (3). Net advisory price is calculated as (4) + (5) - (6) + (7), and therefore, is stated on a harvest equivalent basis. The market benchmark price is stated on a harvest equivalent basis. LDP stands for loan deficiency payment and MLG stands for marketing loan gain. The market benchmark price is the average daily cash price for the two-year marketing window from June 1997 through May 1999.

¹ At the time of analysis for this report, Ag Profit by Hjort Associates had not made any cash sales of 1998 wheat. In order to complete the analysis, all remaining cash quantities are sold as of May 31, 2000. Future AgMAS pricing reports will update and revise results for this program when the final pricing decisions are made.

² At the time of analysis for this report, Allendale (futures only) had not made any cash sales of 1998 wheat. However, the crop is fully hedged using wheat futures. In order to complete the analysis, the futures positions are closed and all remaining cash quantities sold as of May 31, 2000. Future AgMAS pricing reports will update and revise results for this program when the final pricing decisions are made.

Table 9. Revenue Performance Results for Market Advisory Programs, Two-Year, Three-Year, and Four-Year Averages

Market Advisory Program	1995 Net Advisory Revenue	1996 Net Advisory Revenue	1997 Net Advisory Revenue	1998 Net Advisory Revenue	(1997-1998) Two-Year Average Revenue	(1996-1998) Three-Year Average Revenue	(1995-1998) Four-Year Average Revenue	Annual Cost of Service
				---\$/acre---				---\$/year---
Ag Line by Doane (cash-only)	185	170	185	105	145	153	161	300
Ag Line by Doane (hedge)	N/A	N/A	N/A	103	N/A	N/A	N/A	300
Ag Profit by Hjort Associates ¹	204	155	114	68	91	112	135	280
Ag Resource	190	188	87	109	98	128	143	600
Ag Review	212	137	128	115	121	127	148	450
Agri-Edge (cash-only)	181	113	N/A	N/A	N/A	N/A	N/A	N/A
Agri-Edge (hedge)	179	118	N/A	N/A	N/A	N/A	N/A	N/A
Agri-Visor Aggressive Cash	144	153	143	116	129	137	139	299
Agri-Visor Aggressive Hedge	180	159	143	107	125	136	147	299
Agri-Visor Basic Cash	136	149	143	110	126	134	134	299
Agri-Visor Basic Hedge	176	146	143	105	124	131	142	299
Allendale (futures only) ²	150	112	201	135	168	149	149	240
Brock (cash-only)	155	152	216	141	179	170	166	240
Brock (hedge)	150	143	227	170	198	180	172	240
Freese-Notis	165	168	210	130	170	169	168	360
Grain Field Report	171	137	N/A	N/A	N/A	N/A	N/A	N/A
Harris Weather/Elliott Advisory	185	139	N/A	N/A	N/A	N/A	N/A	N/A
North American Ag.	188	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pro Farmer (cash-only)	177	156	187	122	155	155	161	324
Pro Farmer (hedge)	197	143	184	126	155	151	163	324
Progressive Ag.	N/A	163	158	129	143	150	N/A	240
Prosperous Farmer	148	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stewart-Peterson Advisory Reports	150	146	194	134	164	158	156	180
Stewart-Peterson Strictly Cash	163	148	204	138	171	164	164	99
Top Farmer Intelligence	135	137	166	114	140	139	138	240
Utterback Marketing Services	N/A	N/A	253	142	198	N/A	N/A	300
Zwicker Cycle Letter	175	104	143	113	128	120	134	269
<i>Descriptive Statistics:</i>								
<i>Average</i>	171	145	171	121	146	145	151	294
<i>Median</i>	175	146	175	116	144	149	149	299
<i>Minimum</i>	135	104	87	68	91	112	134	99
<i>Maximum</i>	212	188	253	170	198	180	172	600
<i>Range</i>	77	83	167	101	107	68	39	501
<i>Standard Deviation</i>	21	20	42	20	30	18	13	98
Market Benchmark Revenue	162	150	209	148	179	169	167	

Notes: N/A denotes "not applicable" -- program did not exist or was not evaluated for that marketing year. Net advisory price and market benchmark price are stated on a harvest equivalent basis. The market benchmark price is the average daily cash price for the two-year marketing window for each crop year.

¹ At the time of analysis for this report, Ag Profit by Hjort Associates had not made any cash sales of 1998 wheat. In order to complete the analysis, all remaining cash quantities are sold as of May 31, 2000. Future AgMAS pricing reports will update and revise results for this program when the final pricing decisions are made.

² At the time of analysis for this report, Allendale (futures only) had not made any cash sales of 1997 or 1998 wheat. However, the crop for both years is fully hedged using wheat futures. In order to complete the analysis, the futures positions are closed and all remaining cash quantities sold as of May 31, 2000. Future AgMAS pricing reports will update and revise results for this program when the final pricing decisions are made.

Table 10. Four-Year Averages and Standard Deviations for 18 Market Advisory Programs, Wheat Net Advisory Price and Advisory Revenue, 1995-1998

Market Advisory Program	Price		Advisory Revenue	
	Average Net Advisory Price	Standard Deviation of Net Advisory Price	Average Revenue	Standard Deviation of Revenue
	---\$/bushel---		---\$/acre---	
Ag Line by Doane (cash-only)	3.37	1.12	161	38
Ag Profit by Hjort Associates ¹	2.93	1.62	135	58
Ag Resource	3.15	1.70	143	53
Ag Review	3.13	1.27	148	44
Agri-Visor Aggressive Cash	2.93	0.87	139	16
Agri-Visor Aggressive Hedge	3.12	1.13	147	31
Agri-Visor Basic Cash	2.82	0.83	134	17
Agri-Visor Basic Hedge	3.00	1.01	142	29
Allendale (futures only) ²	3.00	0.28	149	38
Brock (cash-only)	3.38	0.50	166	34
Brock (hedge)	3.48	0.20	172	38
Freese-Notis	3.46	0.79	168	33
Pro Farmer (cash-only)	3.33	0.82	161	29
Pro Farmer (hedge)	3.36	0.87	163	34
Stewart-Peterson Advisory Reports	3.20	0.52	156	26
Stewart-Peterson Strictly Cash	3.35	0.53	164	29
Top Farmer Intelligence	2.85	0.59	138	21
Zwicker Cycle Letter	2.76	0.79	134	32
<i>Descriptive Statistics:</i>				
<i>Average</i>	3.15	0.86	151	33
<i>Median</i>	3.14	0.83	149	33
<i>Minimum</i>	2.76	0.20	134	16
<i>Maximum</i>	3.48	1.70	172	58
<i>Range</i>	0.72	1.50	39	42
Market Benchmark	3.42	0.46	167	29

Note: Results are shown only for the 18 advisory programs included in all four years of the AgMAS wheat evaluations. With few exceptions, the marketing period is a two-year window from June of previous year through May of next year.

¹ At the time of analysis for this report, Ag Profit by Hjort Associates had not made any cash sales of 1998 wheat. In order to complete the analysis, all remaining cash quantities are sold as of May 31, 2000. Future AgMAS pricing reports will update and revise results for this program when the final pricing decisions are made.

² At the time of analysis for this report, Allendale (futures only) had not made any cash sales of 1997 or 1998 wheat. However, the crop for both years is fully hedged using wheat futures. In order to complete the analysis, the futures positions are closed and all remaining cash quantities sold as of May 31, 2000. Future AgMAS pricing reports will update and revise results for this program when the final pricing decisions are made.

Figure 1. West Southwest Illinois Crop Reporting District



Figure 2. West Southwest Illinois Price Reporting District



Figure 3. Wheat Yields for West Southwest Illinois, Southwest Kansas, and Northeast South Dakota Crop Reporting Districts from 1972 to 1998

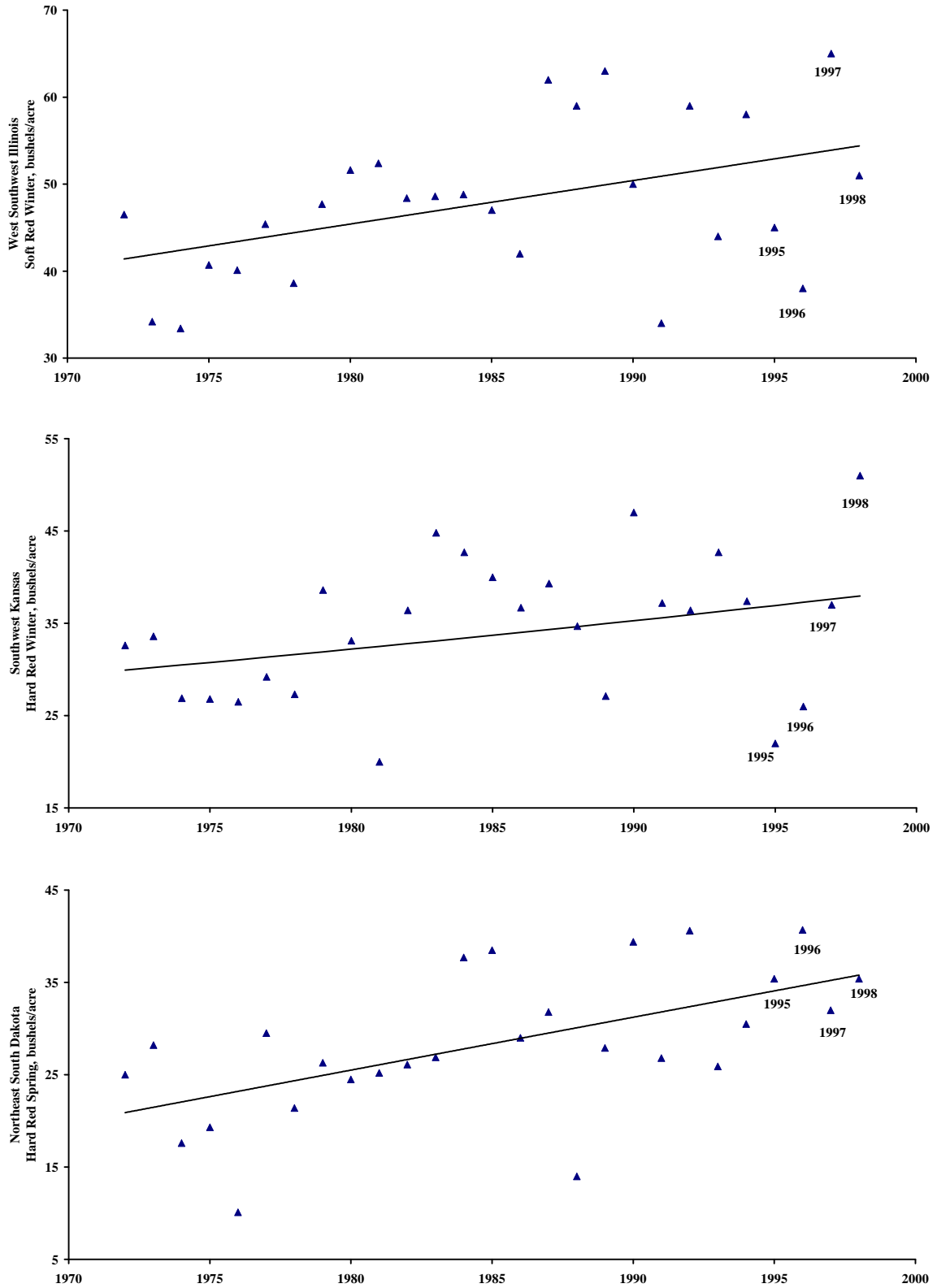


Figure 4. A Comparison Between Deviation from the Trend Yields in West Southwest Illinois Crop Reporting District versus Southwest Kansas and Northeast South Dakota Crop Reporting Districts

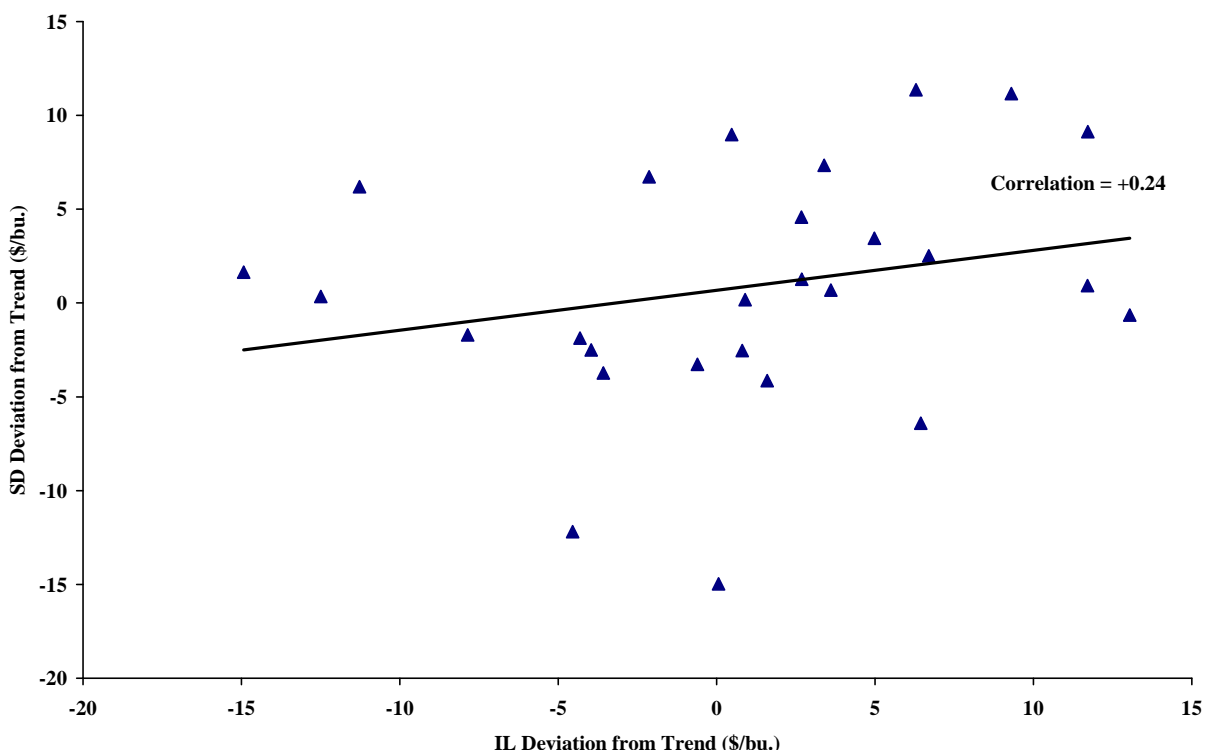
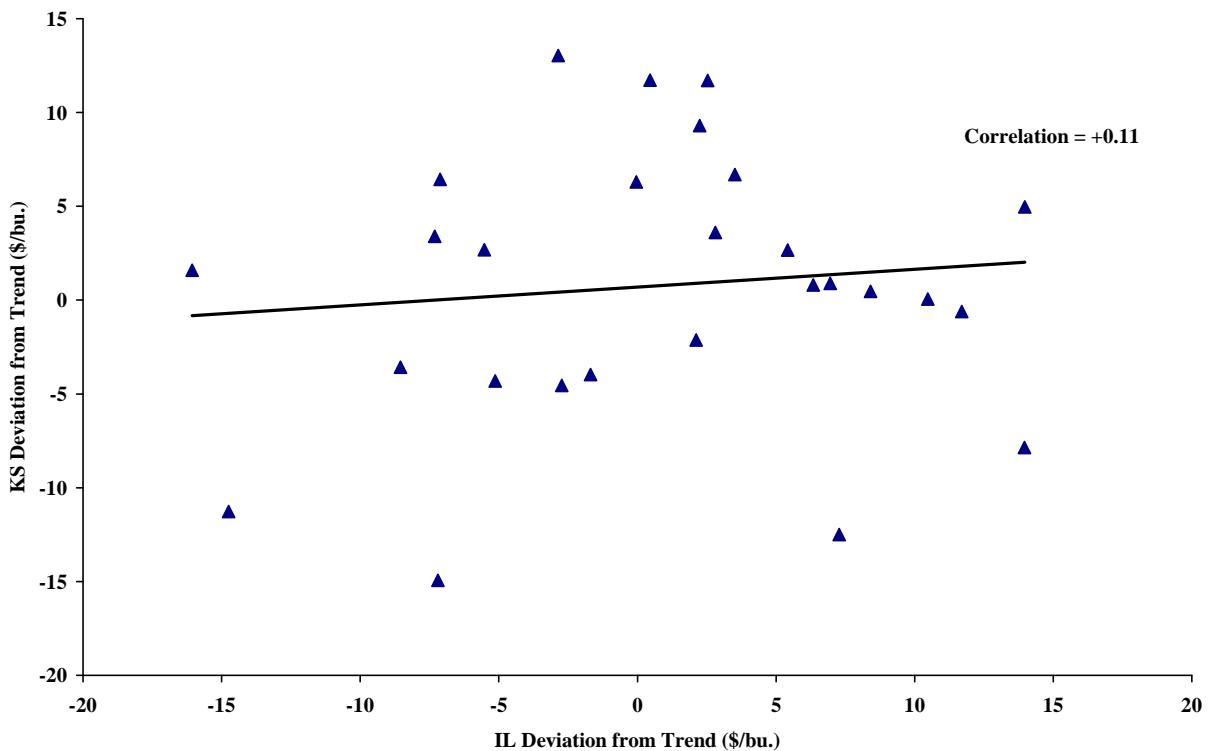


Figure 5. Daily Soft Red Winter Wheat Cash Prices for the West Southwest Illinois Price Reporting District from 1995 to 1999

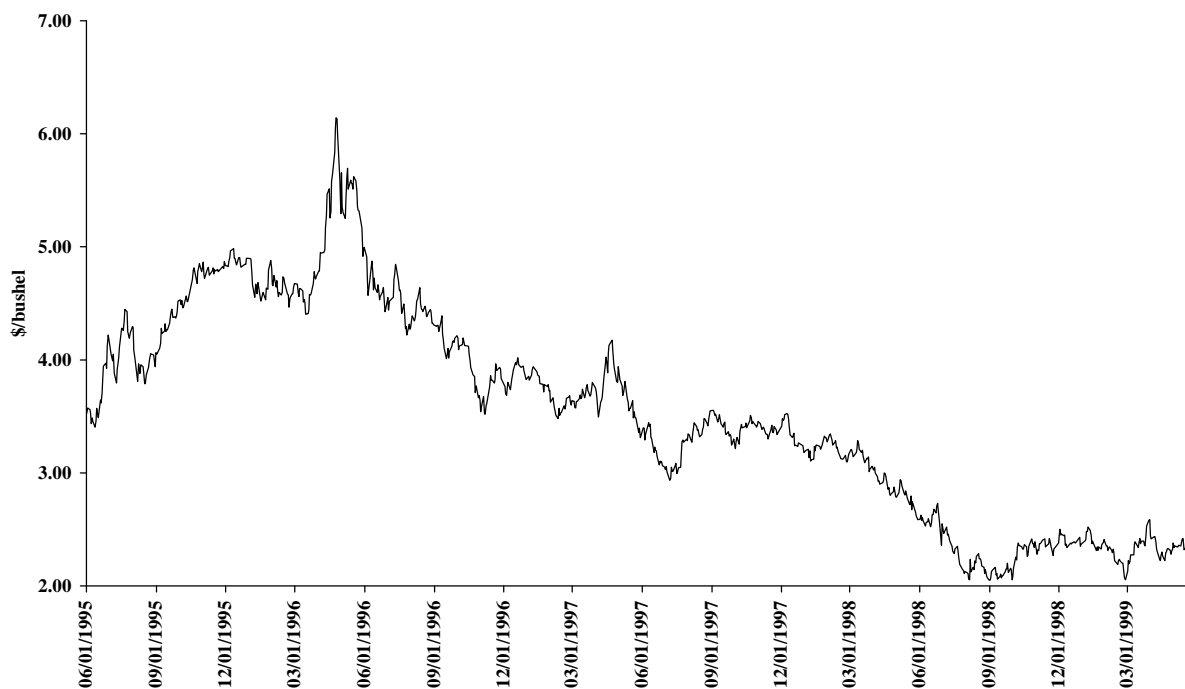


Figure 6. Daily Hard Red Winter Wheat Cash Prices for the Western Kansas Price Reporting District and Hard Red Spring Cash Prices for the East River South Dakota Price Reporting District from 1995 to 1999

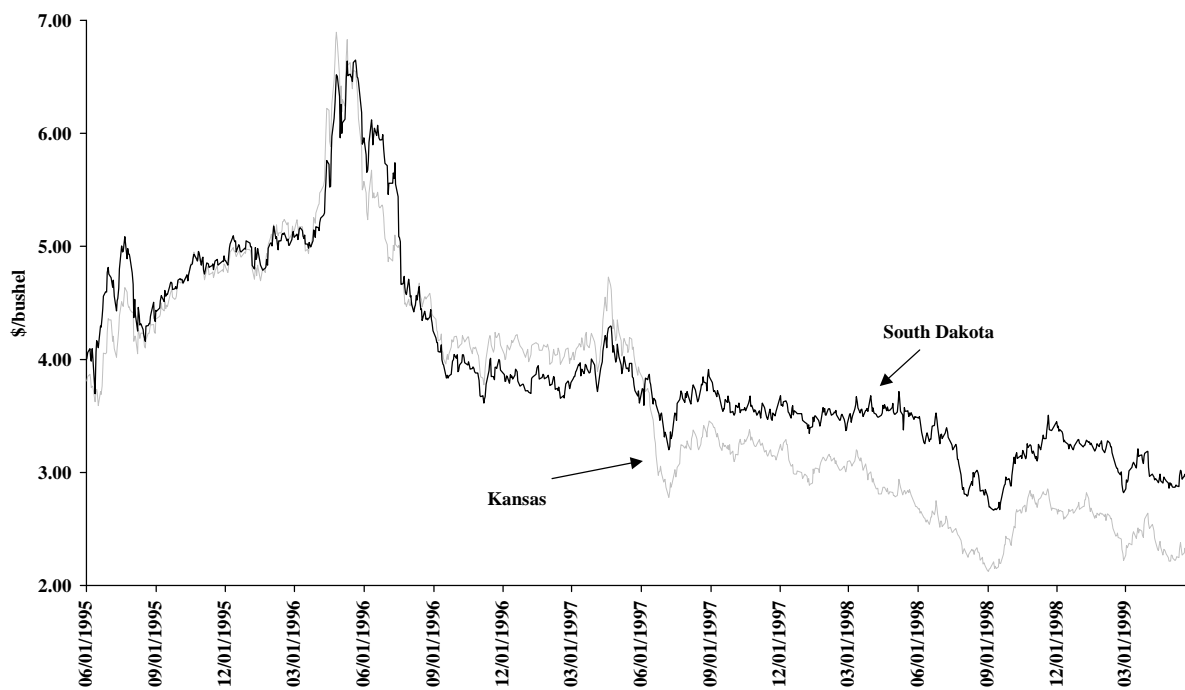


Figure 7. Comparison of the Daily Change in Prices Between the West Southwest Illinois Price Reporting District and the Western Kansas and East River South Dakota Price Reporting Districts, June 1995 through May 1999

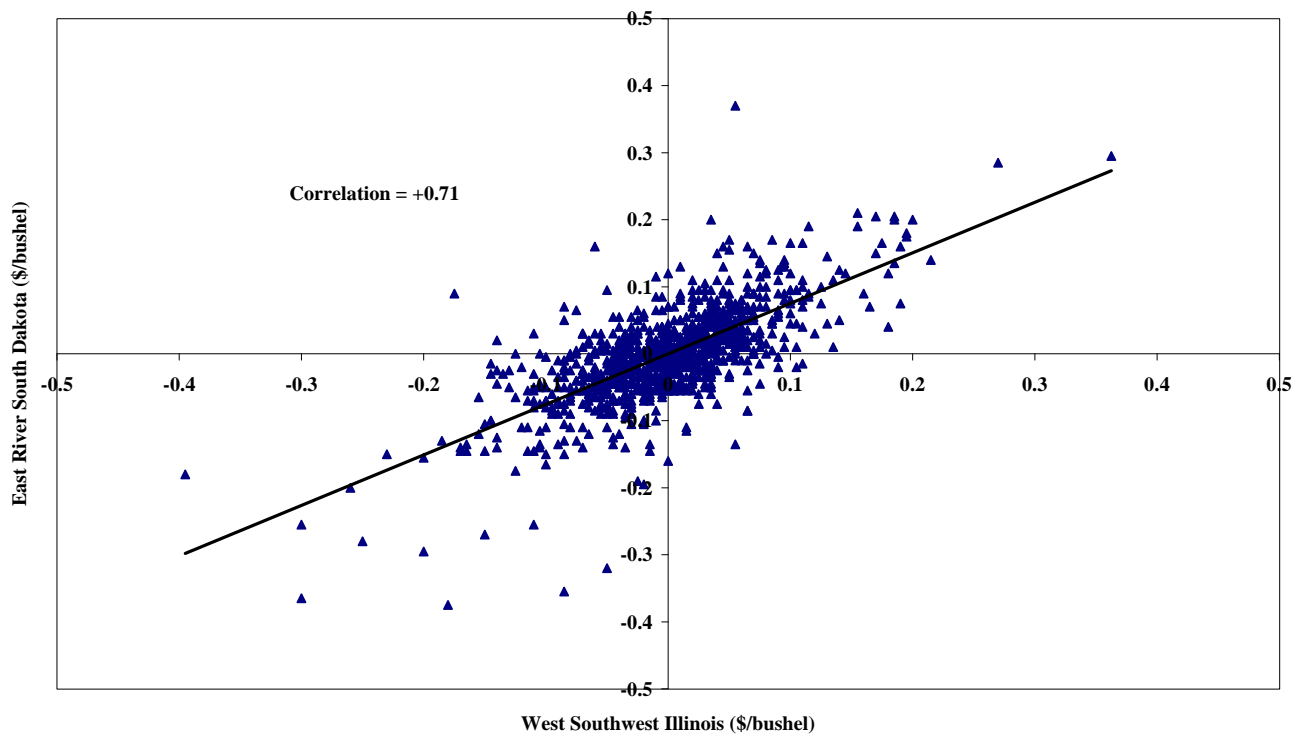
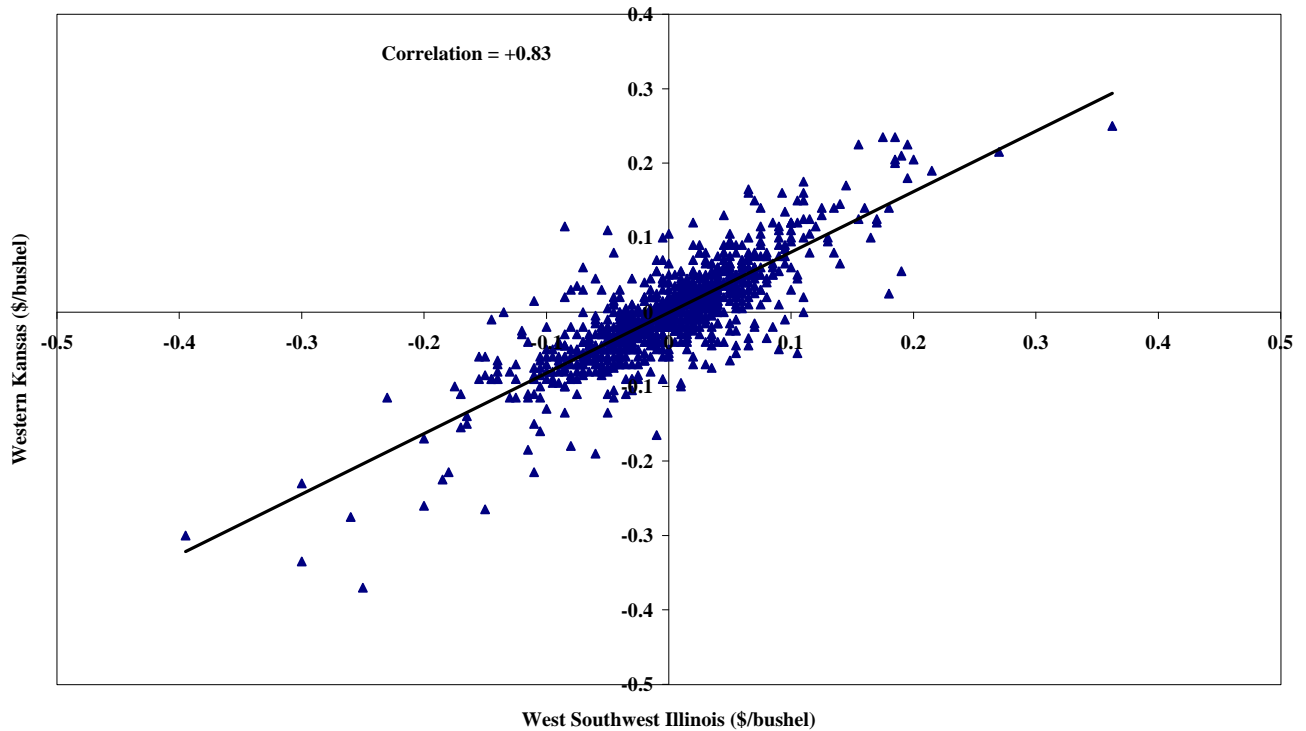


Figure 8. Loan Deficiency Payment (LDP) and Marketing Loan Gain (MLG) Rates for Wheat, Southwest Illinois, 1998 Marketing Year

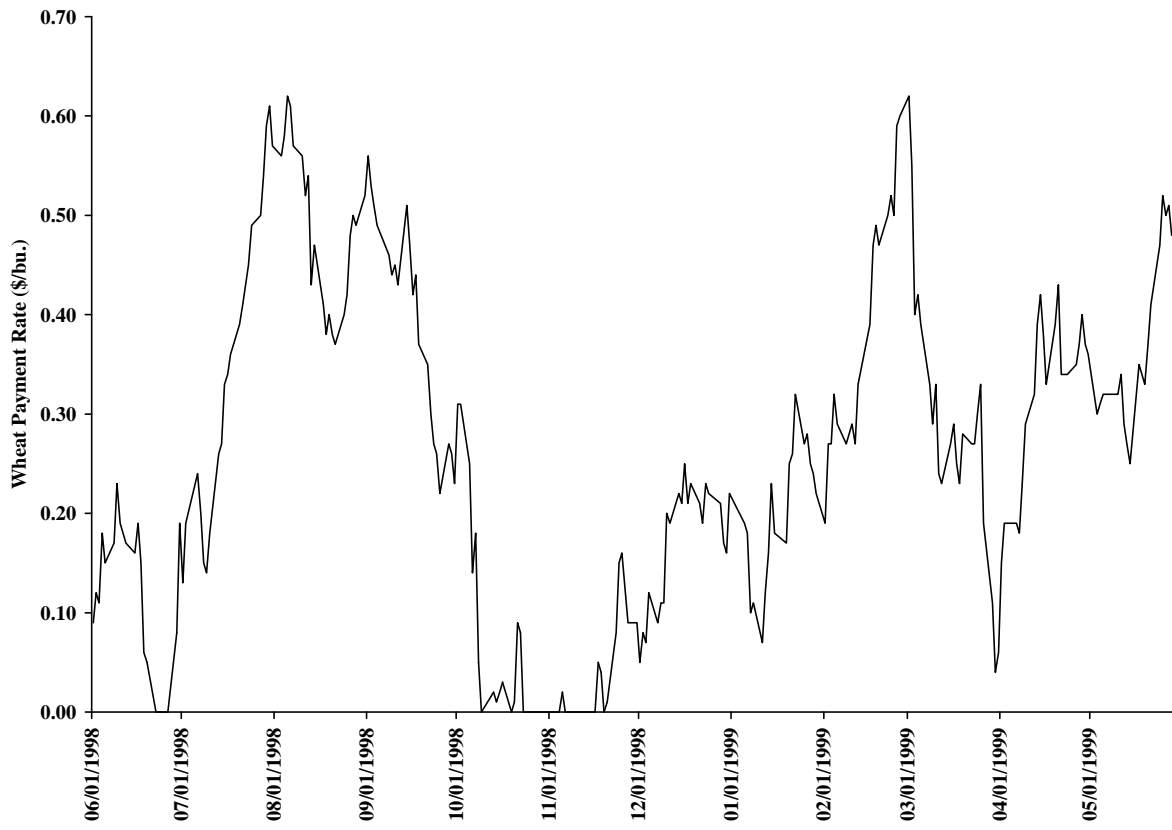


Figure 9. Distribution of Market Advisory Program Performance Relative to Market Benchmark, 1995 Marketing Period

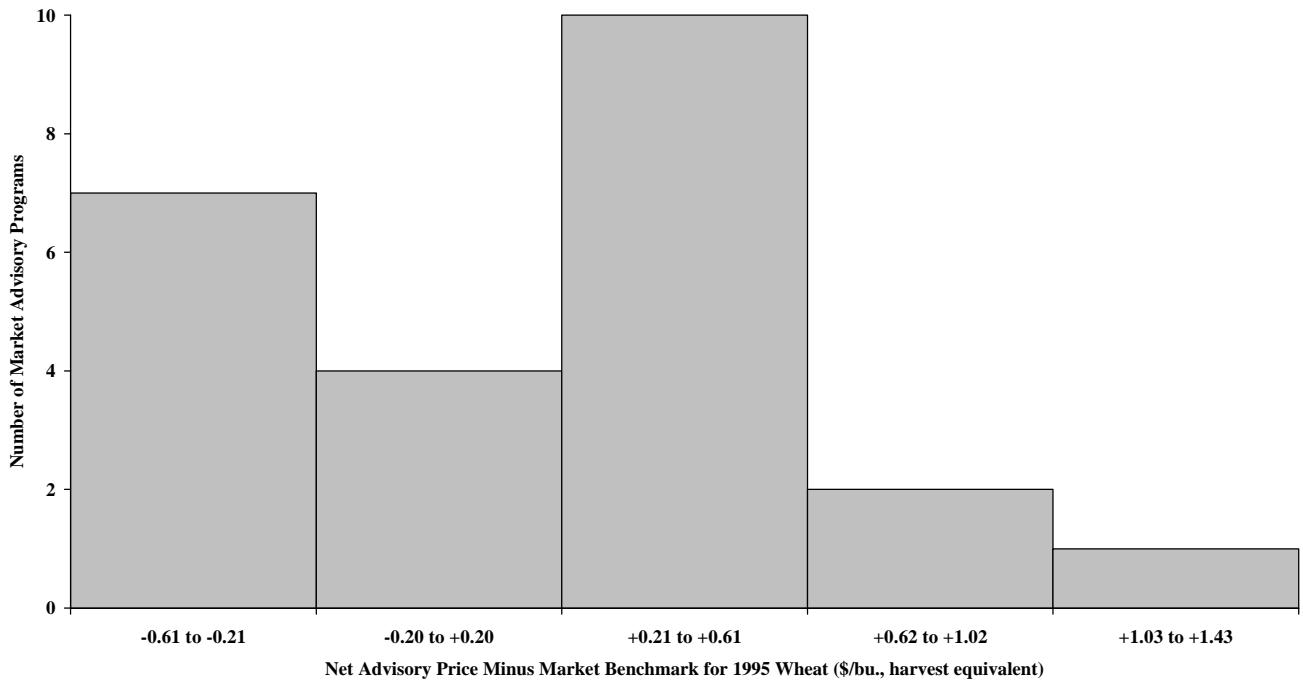


Figure 10. Distribution of Market Advisory Program Performance Relative to Market Benchmark, 1996 Marketing Period

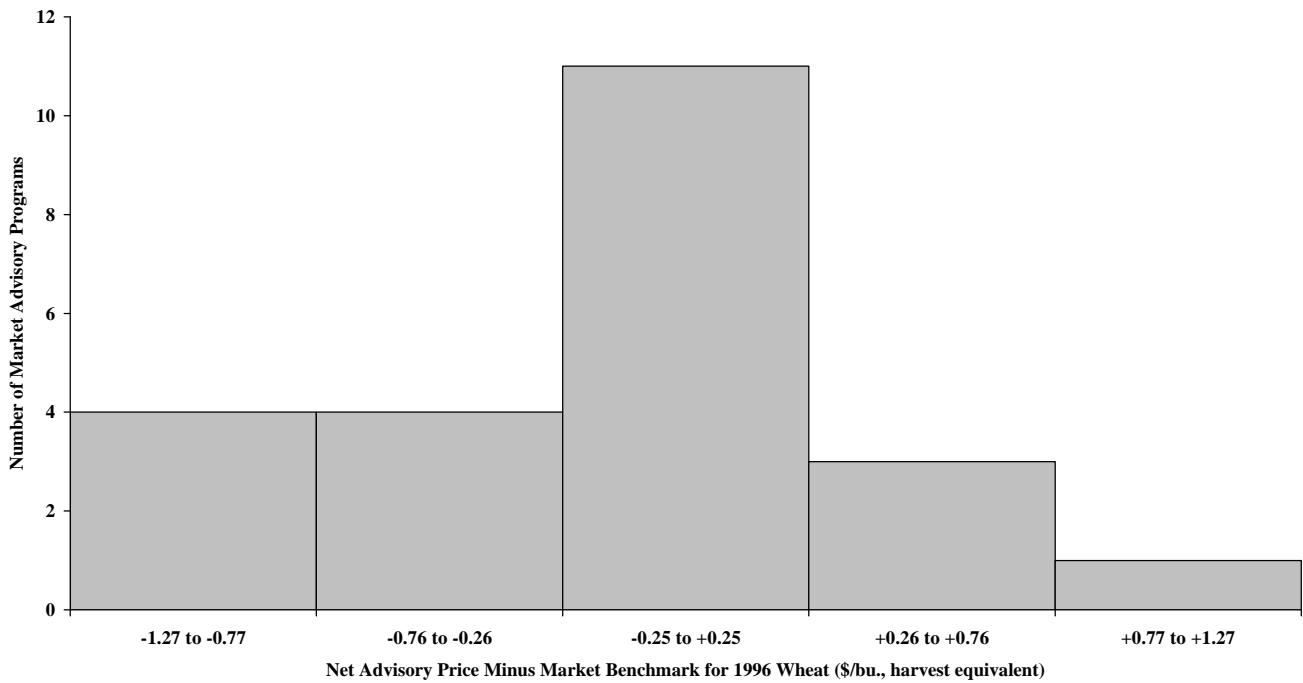


Figure 11. Distribution of Market Advisory Program Performance Relative to Market Benchmark, 1997 Marketing Period

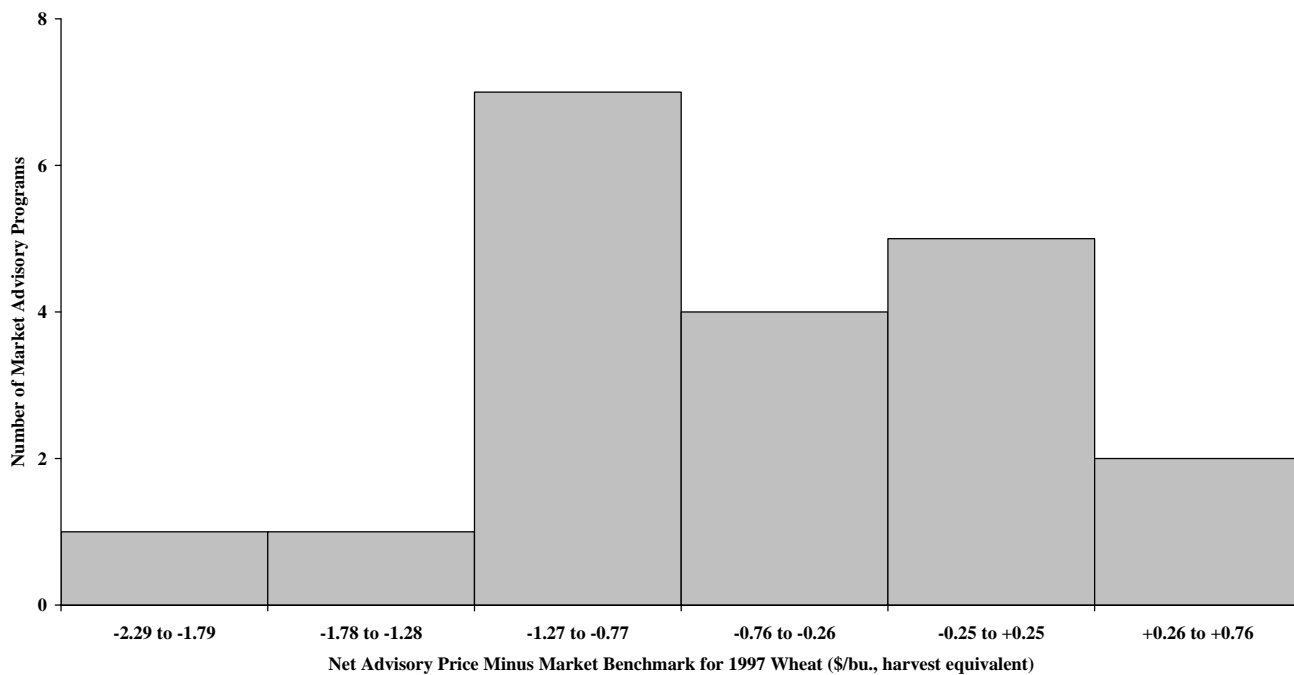


Figure 12. Distribution of Market Advisory Program Performance Relative to Market Benchmark, 1998 Marketing Period

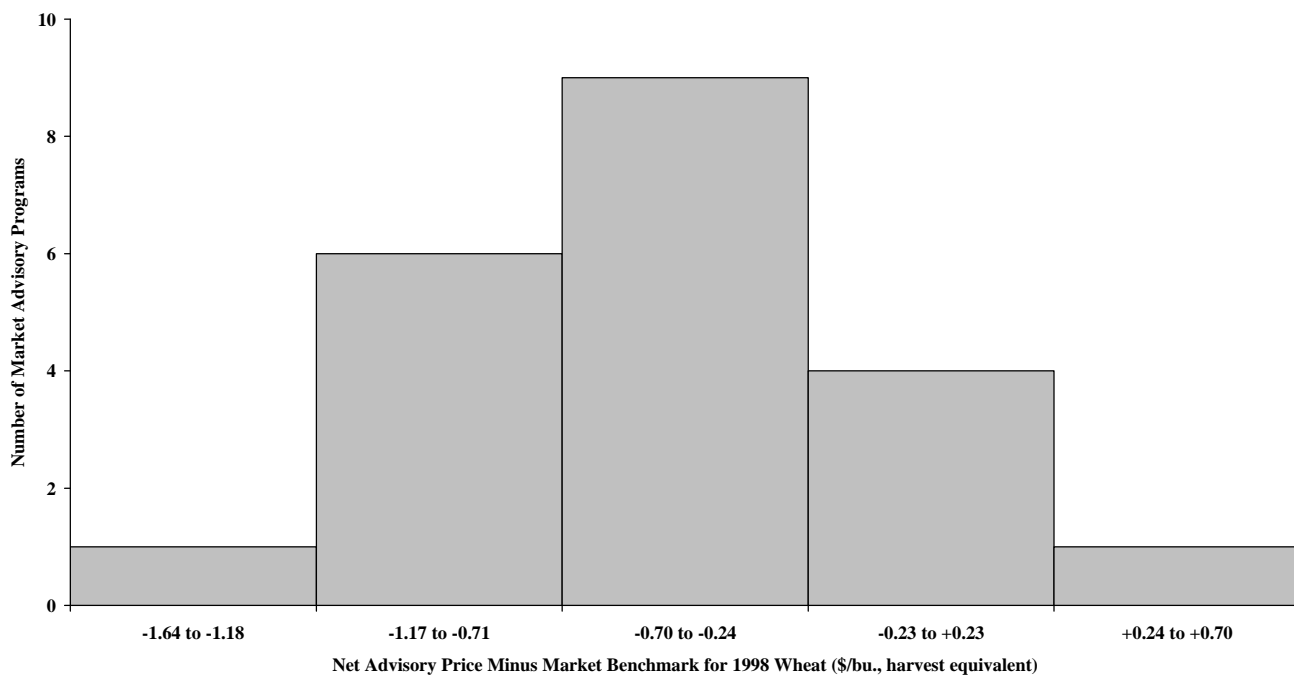


Figure13. Comparison of Advisory Service Program Performance to Market Benchmark, 1995 Marketing Period

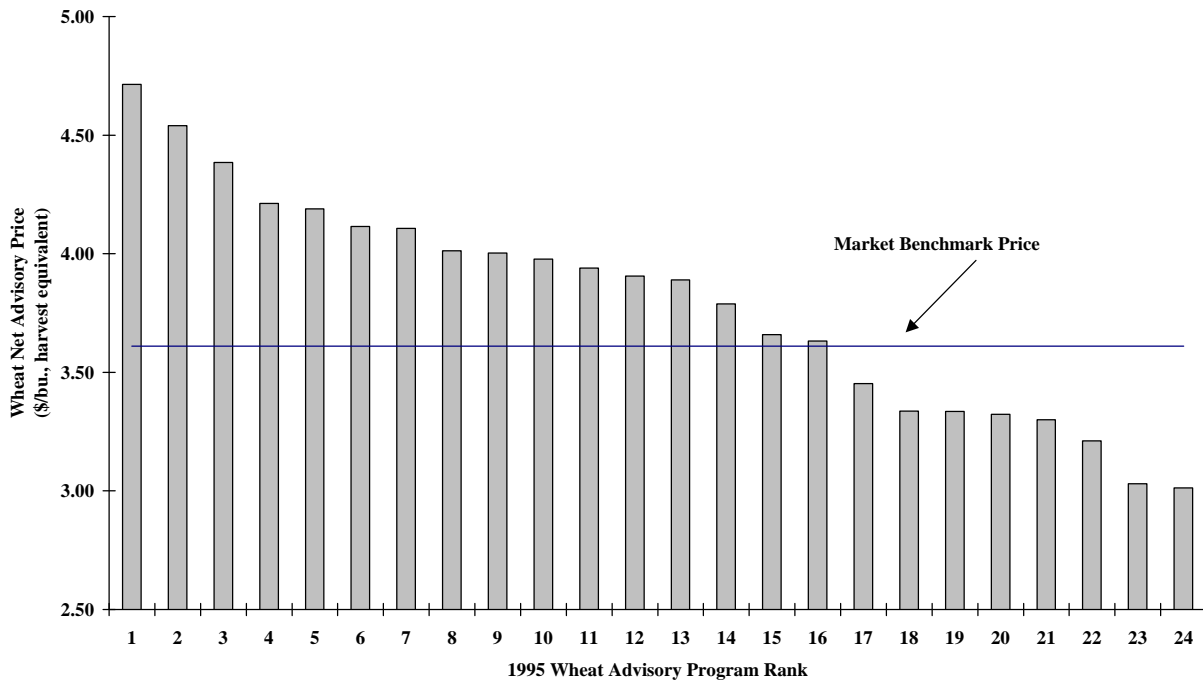


Figure 14. Comparison of Advisory Service Program Performance to Market Benchmark, 1996 Marketing Period

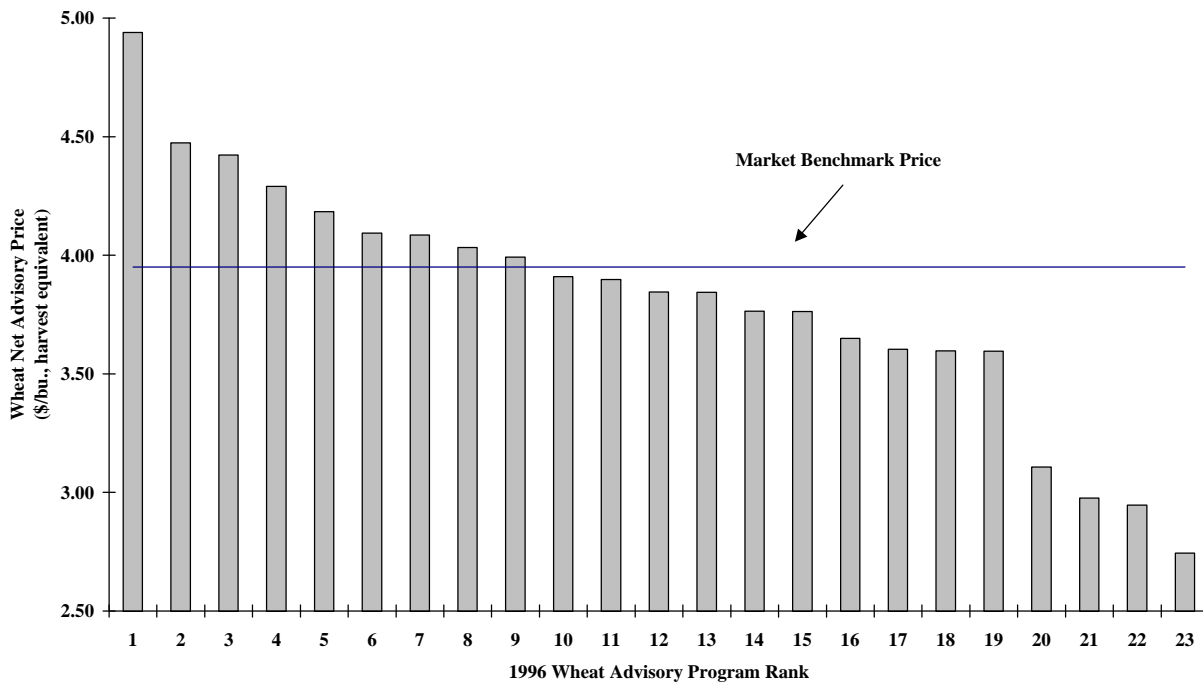


Figure 15. Comparison of Advisory Service Program Performance to Market Benchmark, 1997 Marketing Period

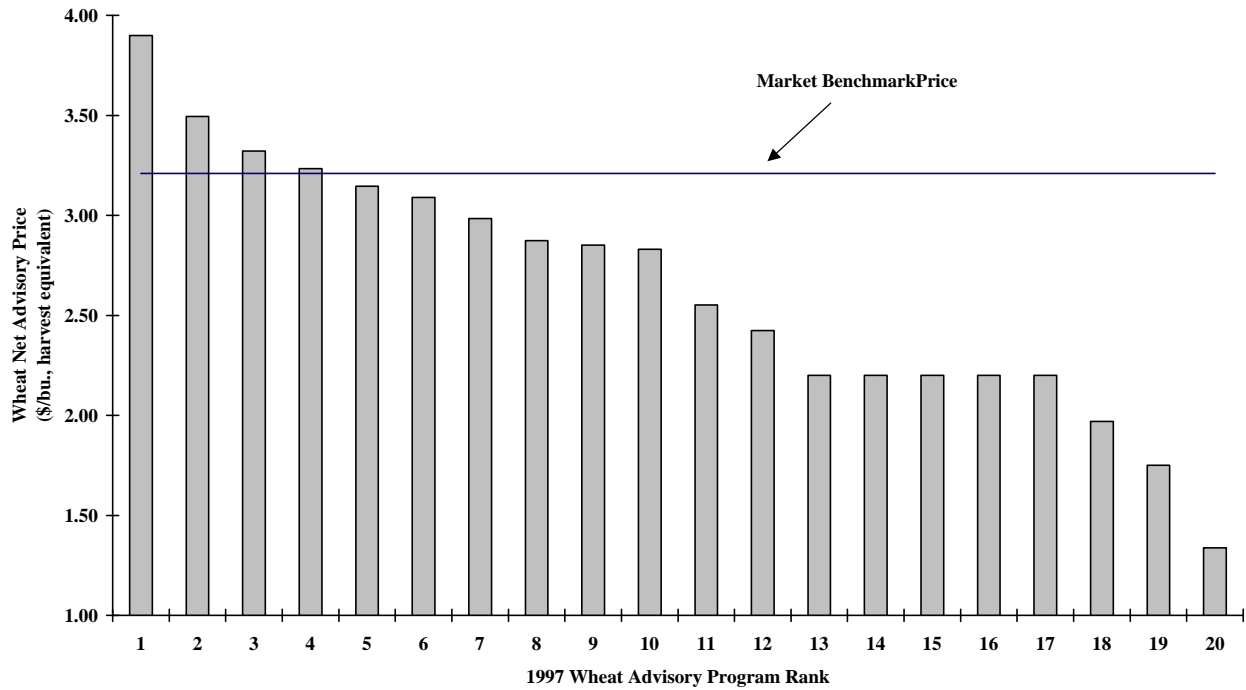


Figure 16. Comparison of Advisory Service Program Performance to Market Benchmark, 1998 Marketing Period

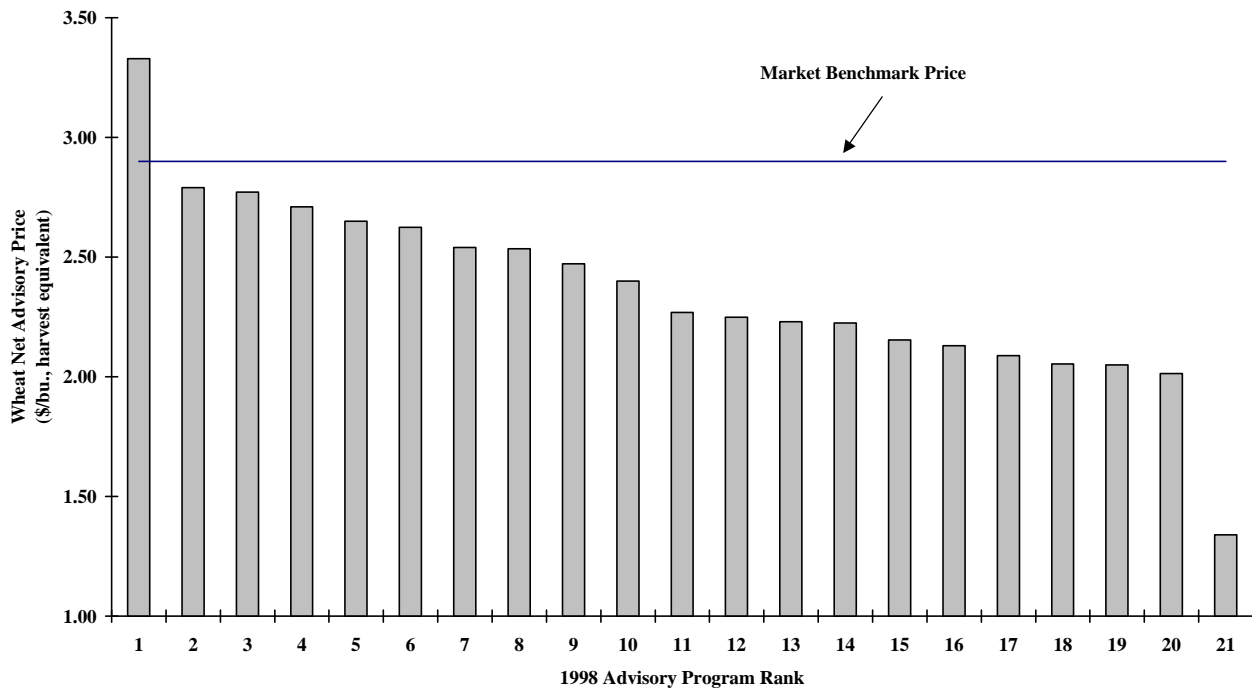


Figure 17. Daily Wheat Prices, Southwest Illinois, 1995 Marketing Period

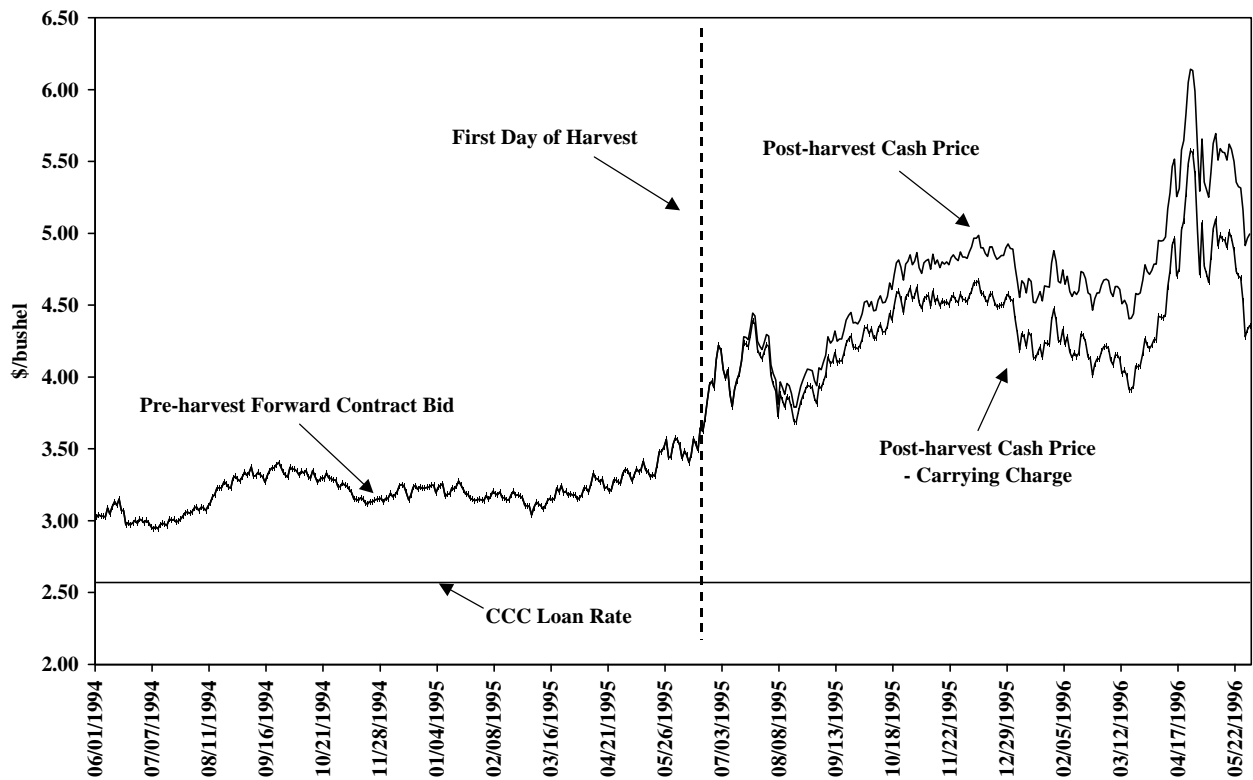
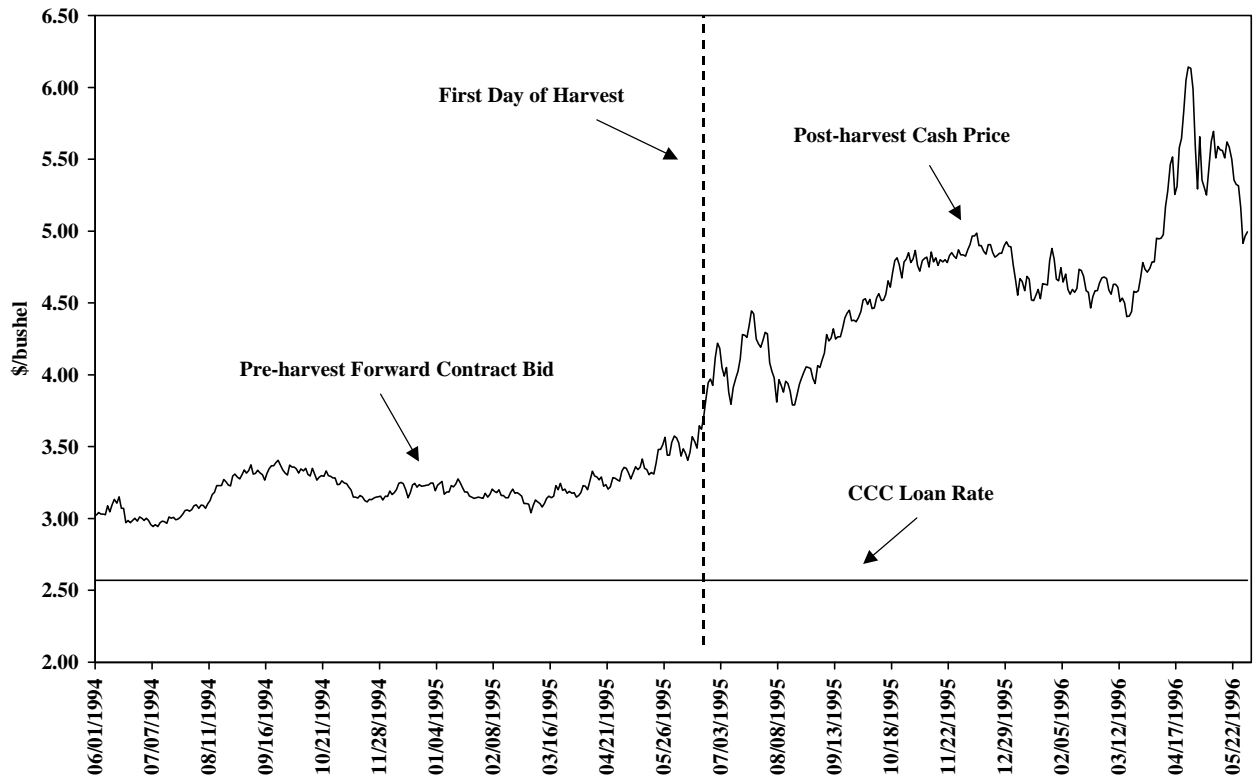


Figure 18. Daily Wheat Prices, Southwest Illinois, 1996 Marketing Period

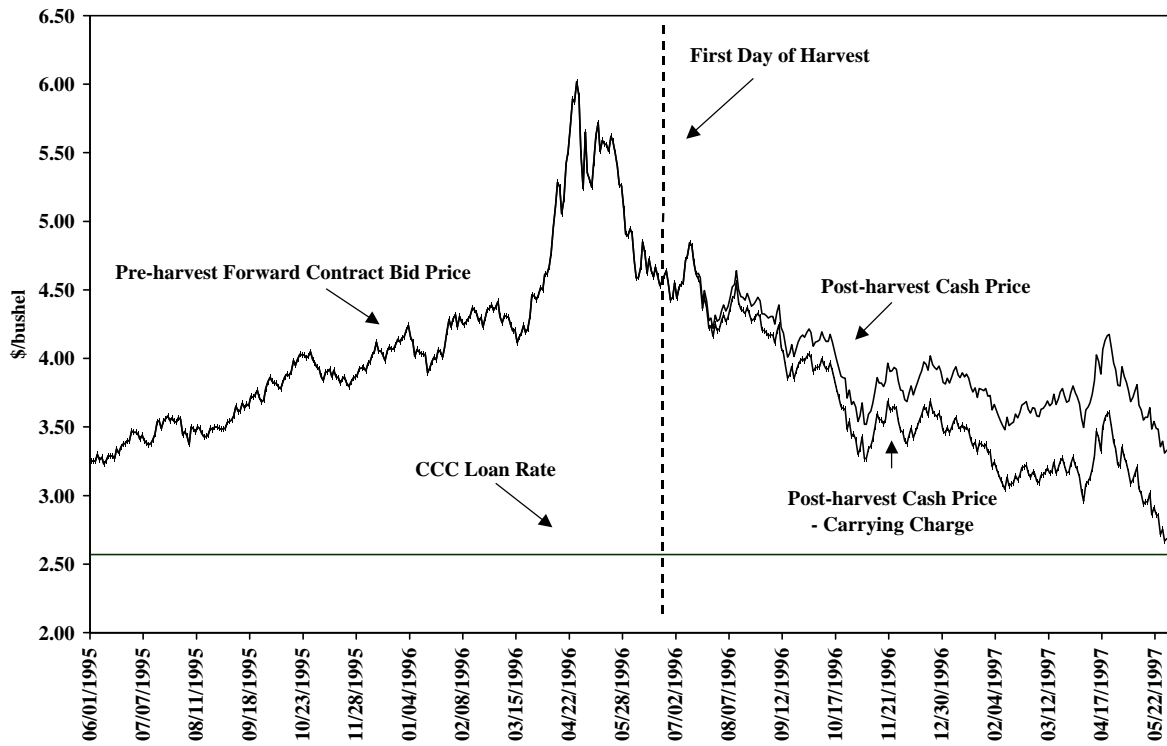
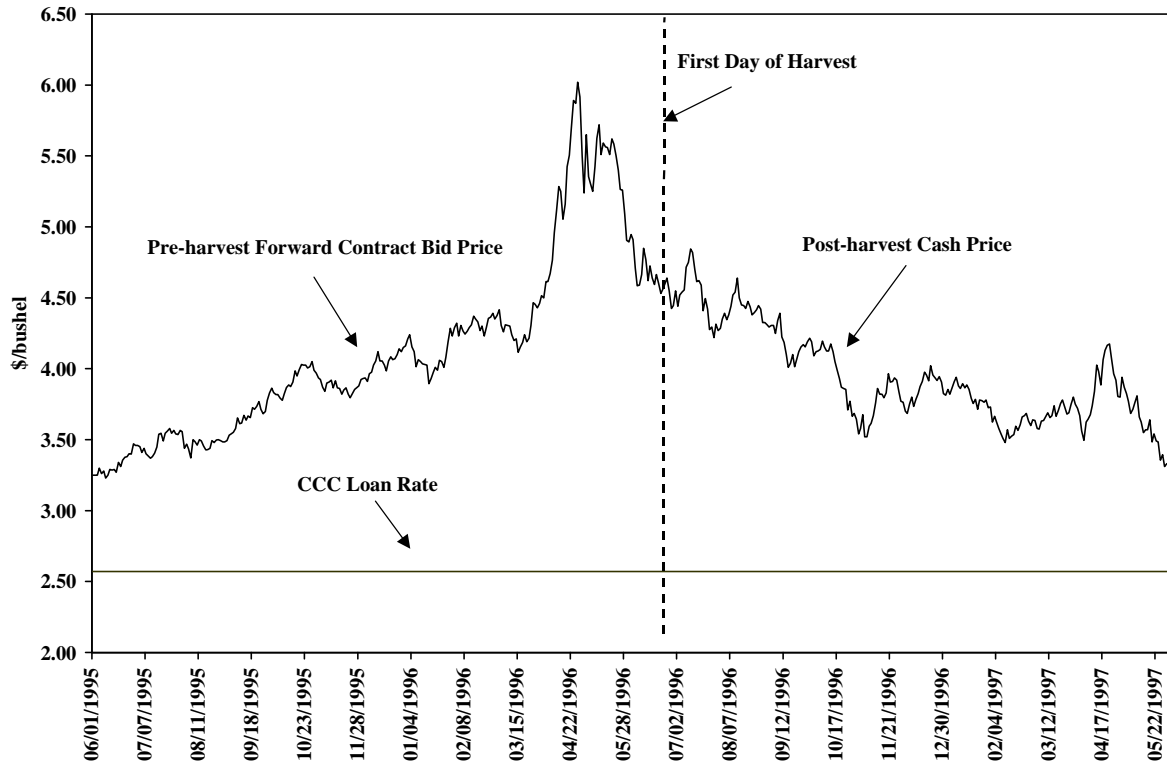


Figure 19. Daily Wheat Prices, Southwest Illinois, 1997 Marketing Period

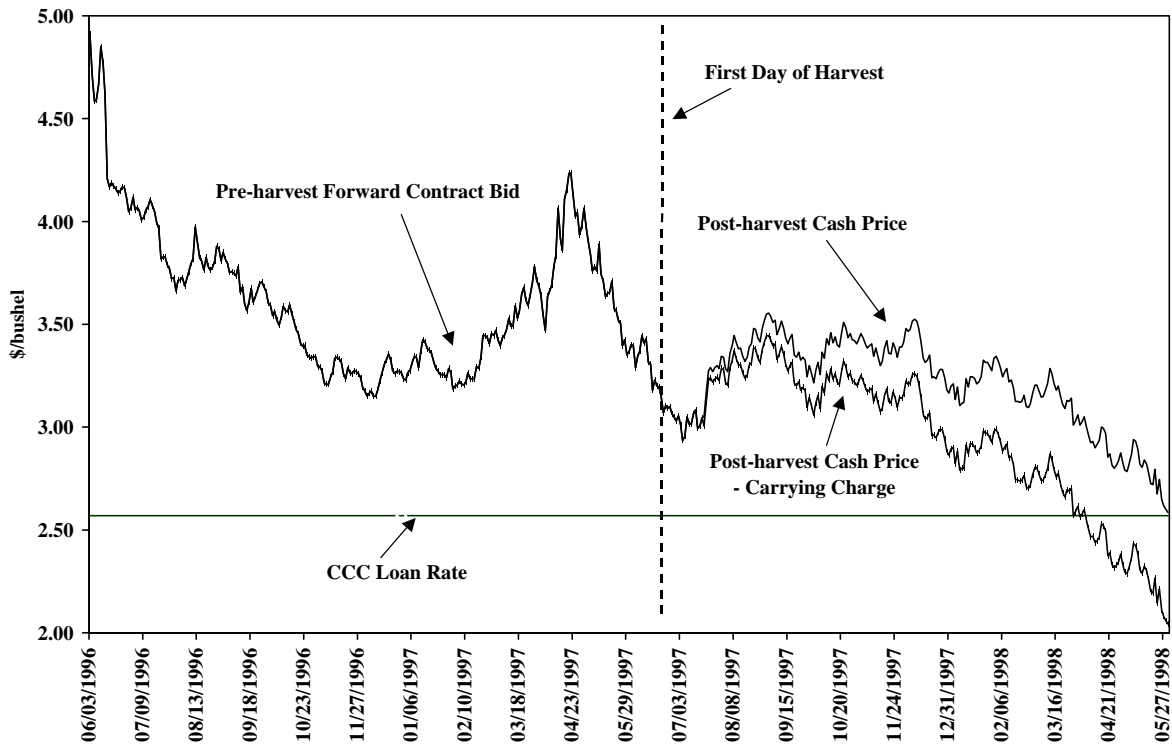
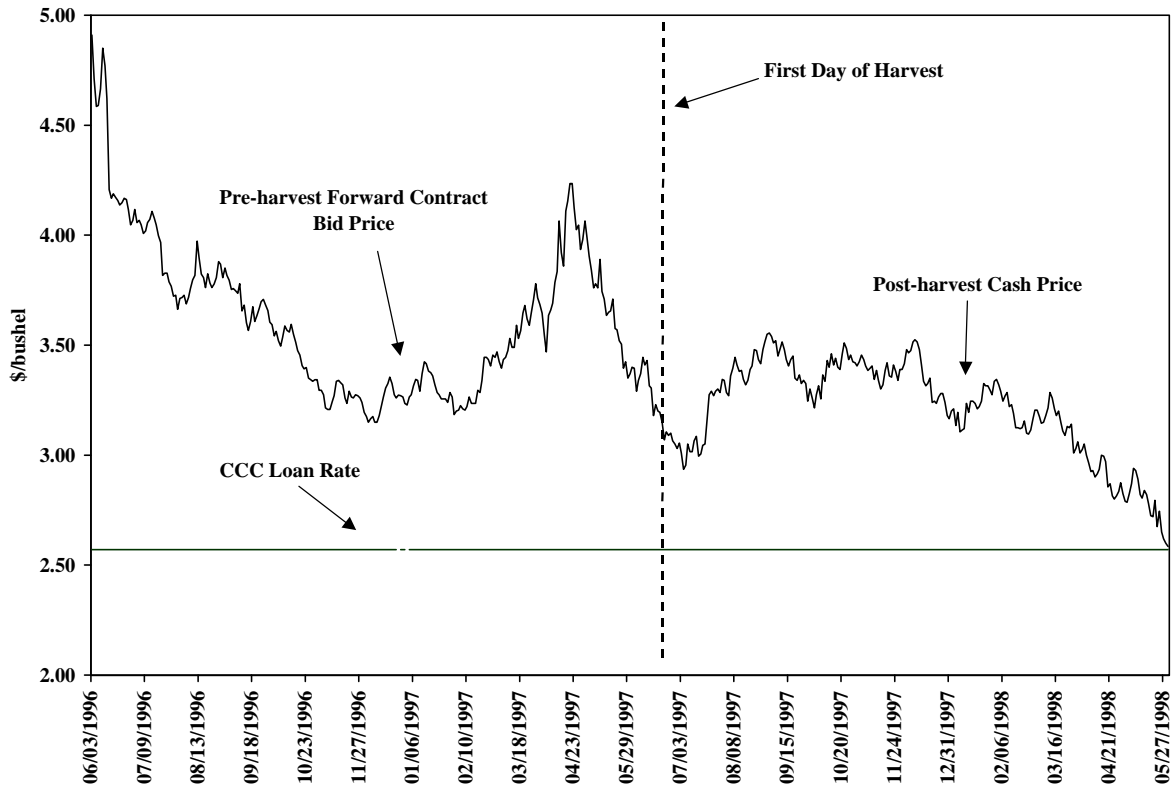


Figure 20. Daily Wheat Prices, Southwest Illinois, 1998 Marketing Period

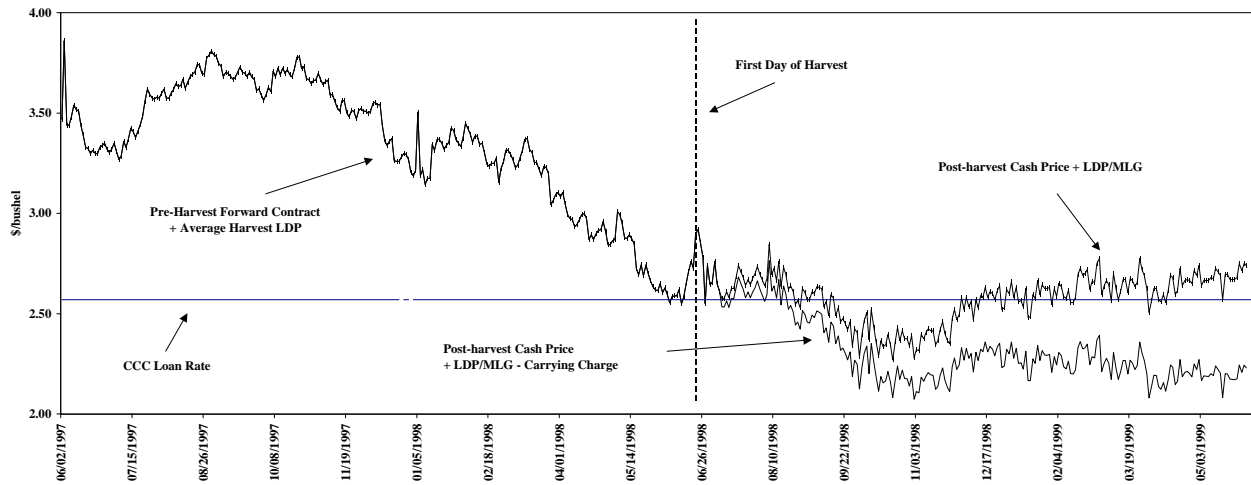
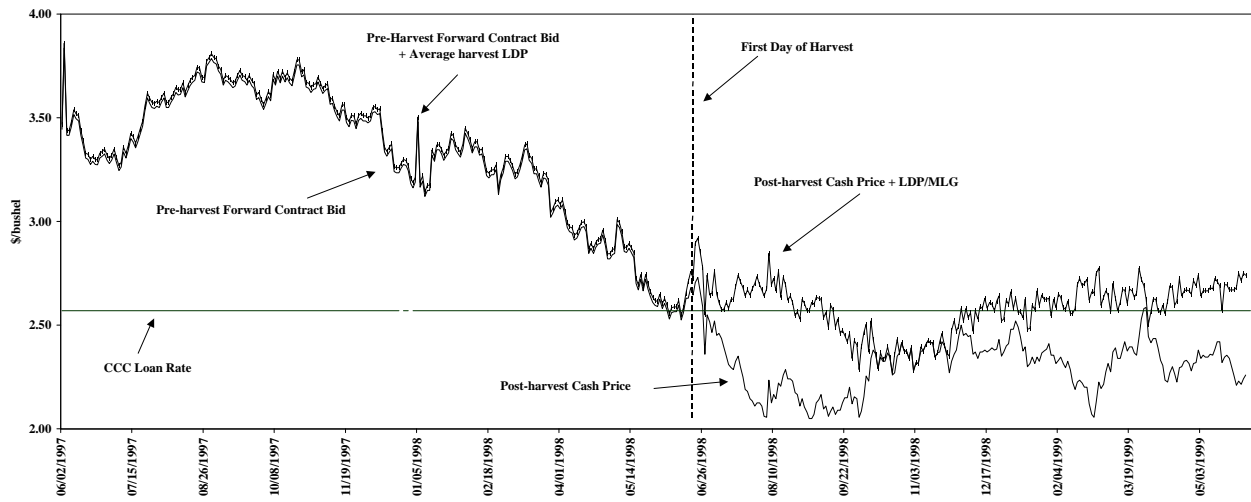
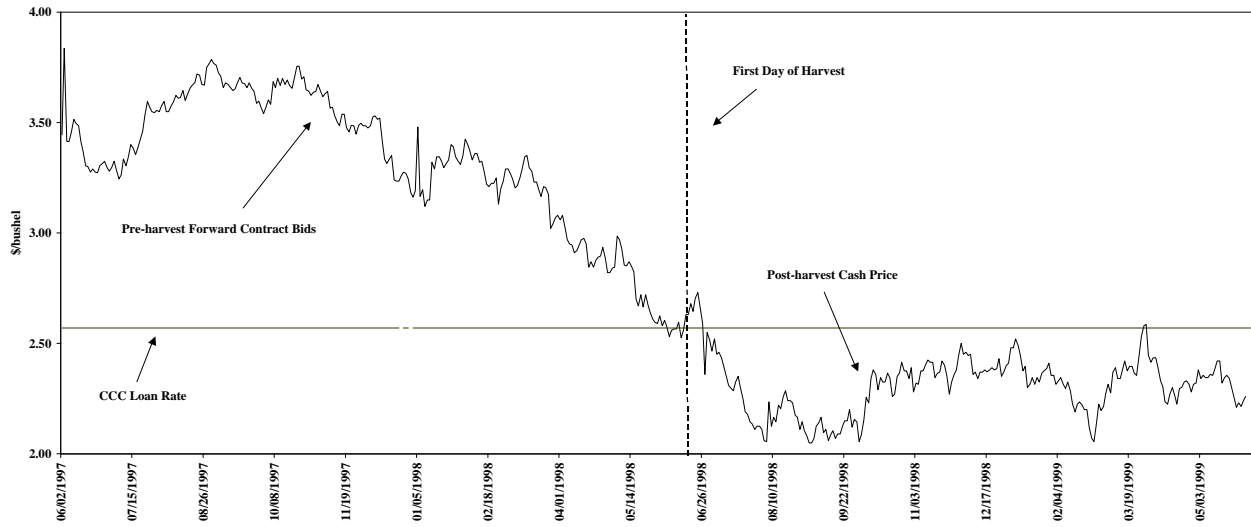


Figure 21. Comparison of Market Advisory Program Performance to Market Benchmark Price and Revenue, Two-Year Average, 1997 - 1998

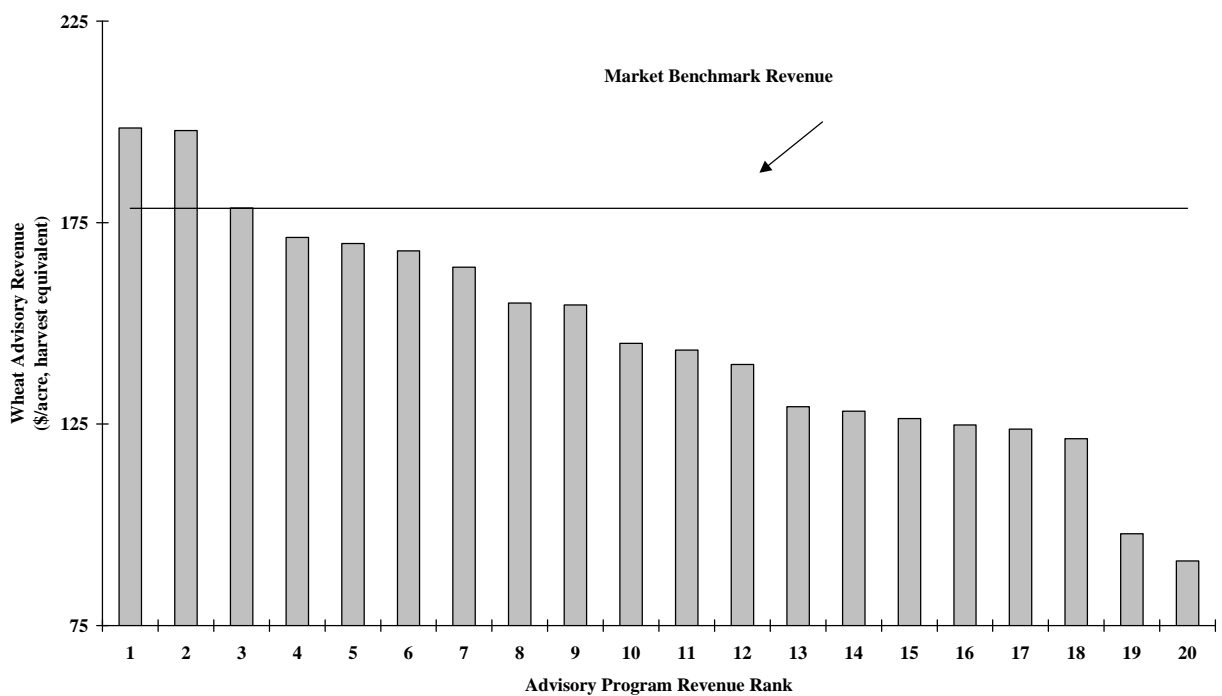
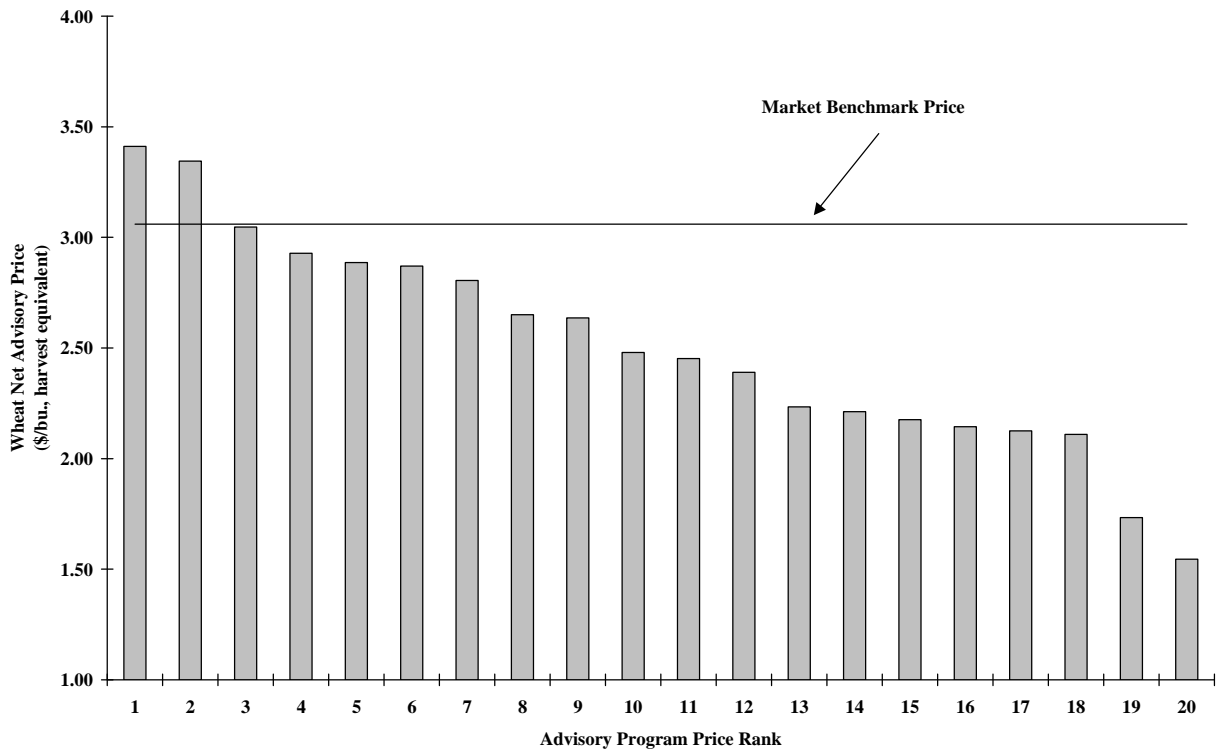


Figure 22. Comparison of Market Advisory Program Performance to Market Benchmark Price and Revenue, Three-Year Average, 1996 - 1998

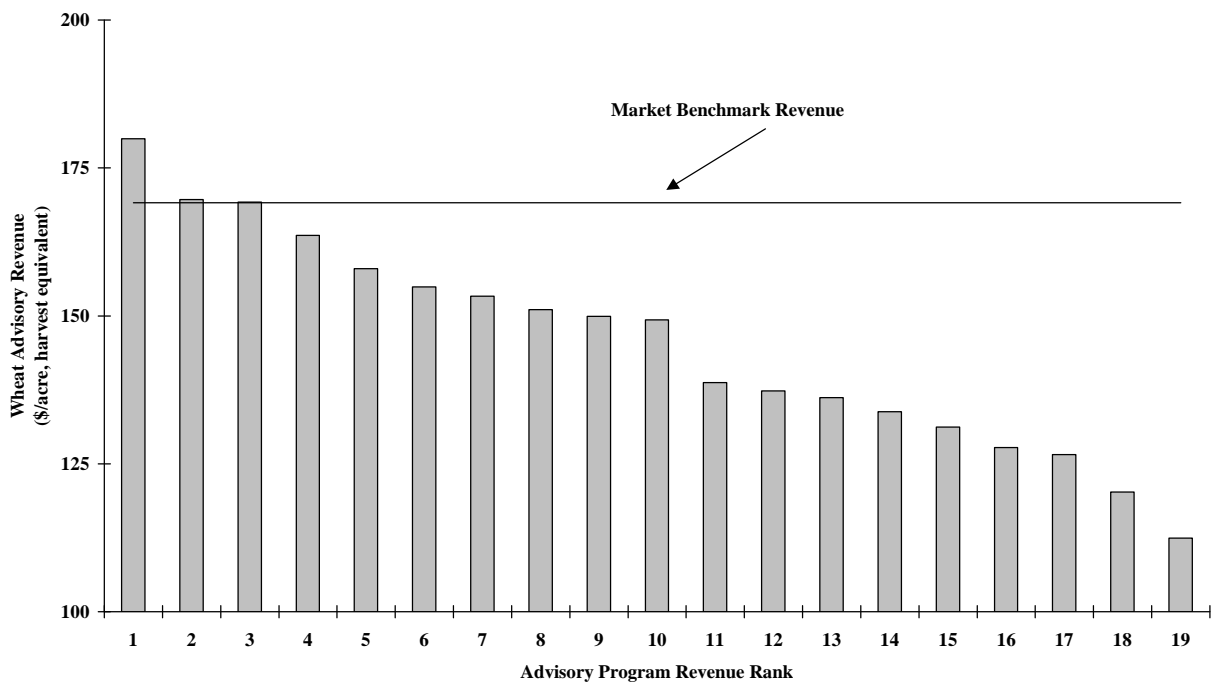
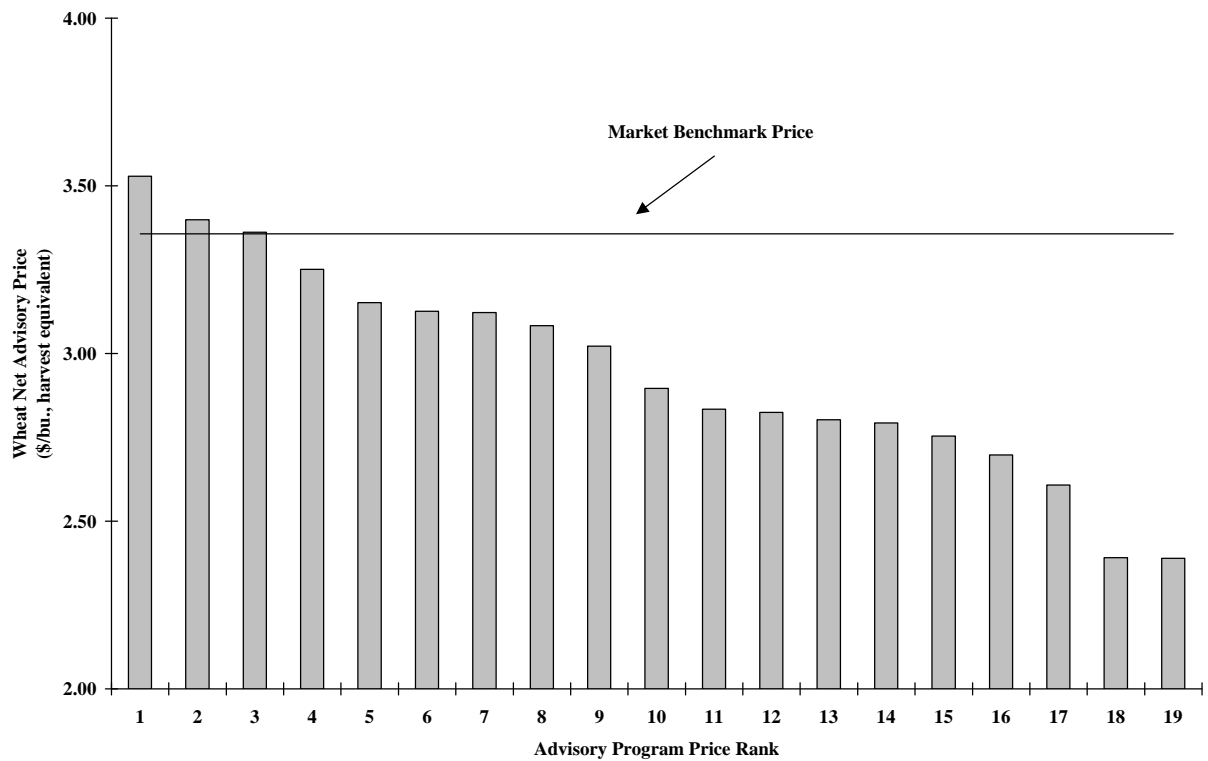


Figure 23. Comparison of Market Advisory Program Performance to Market Benchmark Price and Revenue, Four-Year Average, 1995-1998

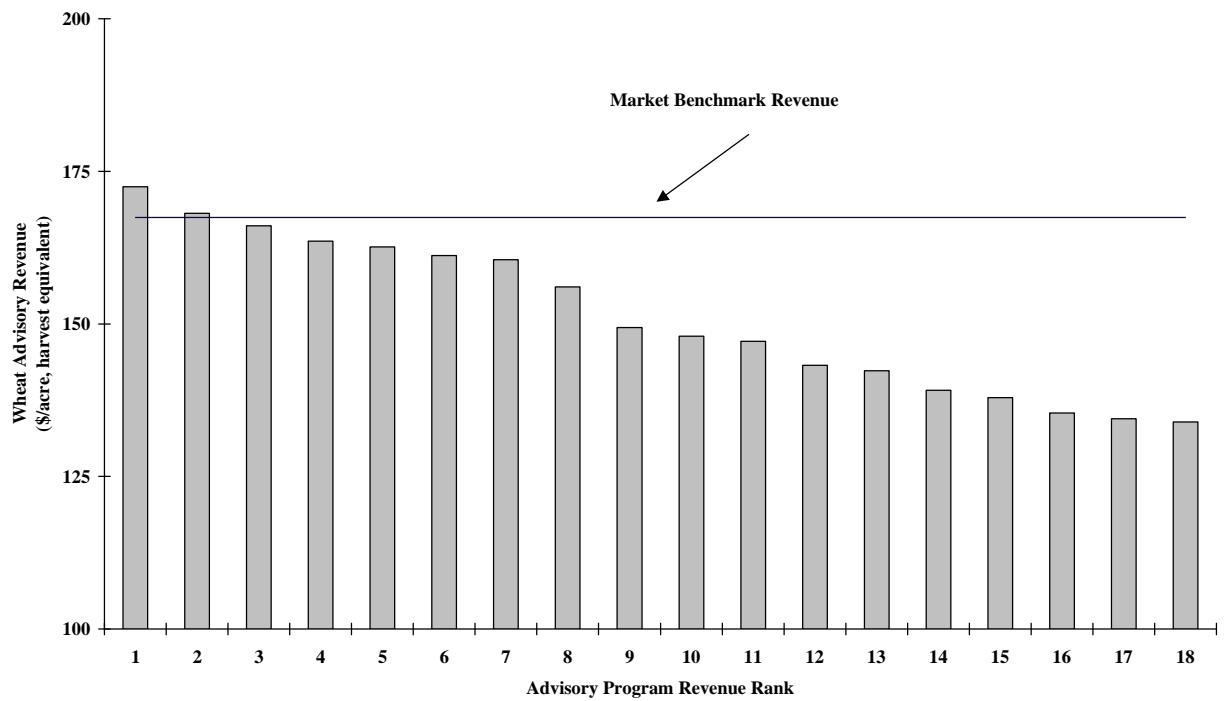
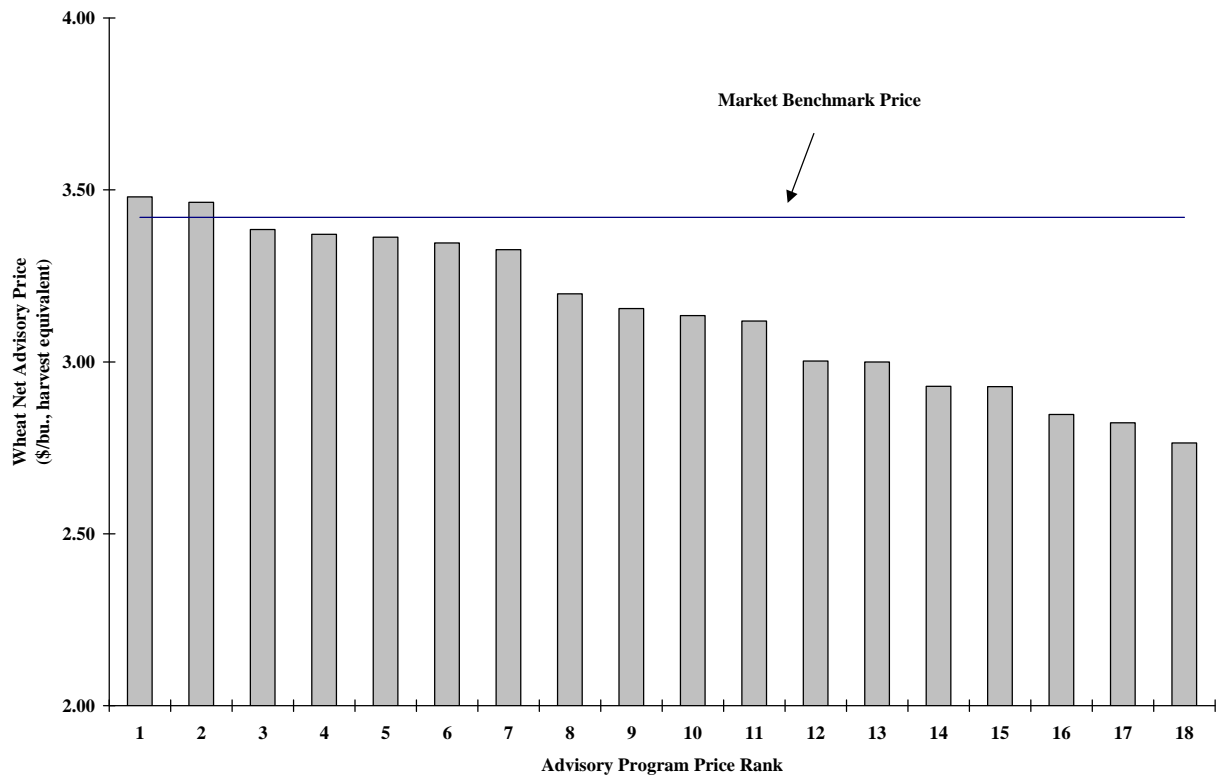


Figure 24. Average Net Advisory Price and Standard Deviation for 18 Market Advisory Programs, Wheat Price, 1995-1998, 24-Month Benchmark

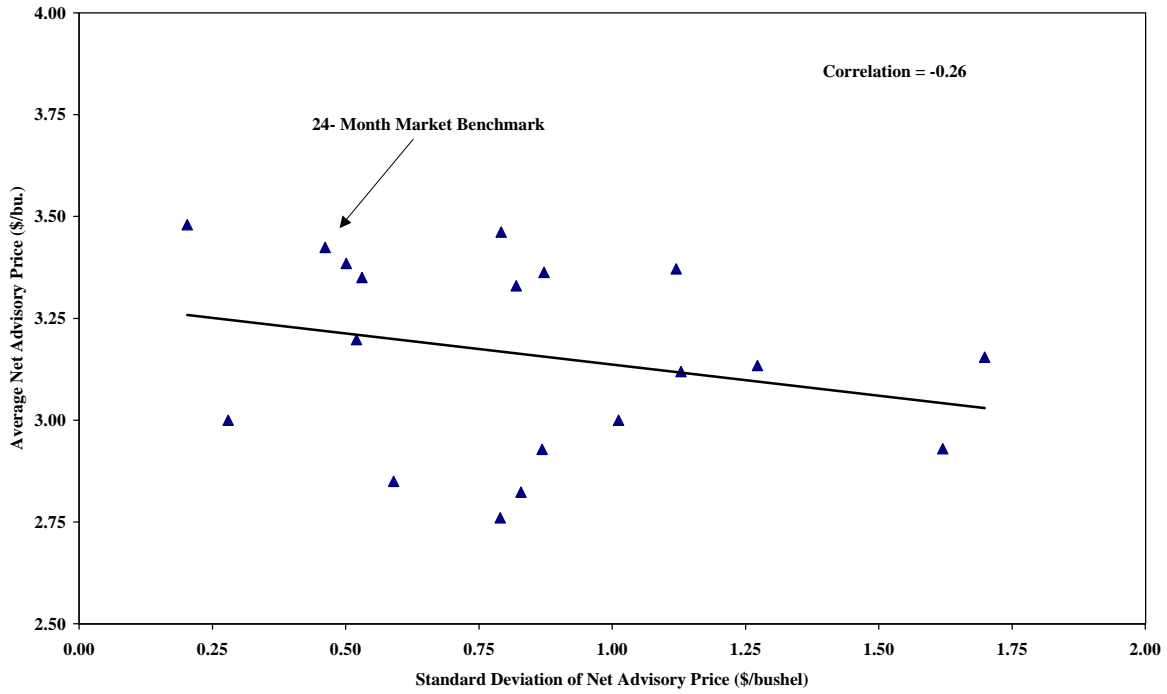


Figure 25. Pricing Performance and Risk of 18 Market Advisory Programs Relative to the Market Benchmark, Wheat Price, 1995-1998, 24-Month Benchmark

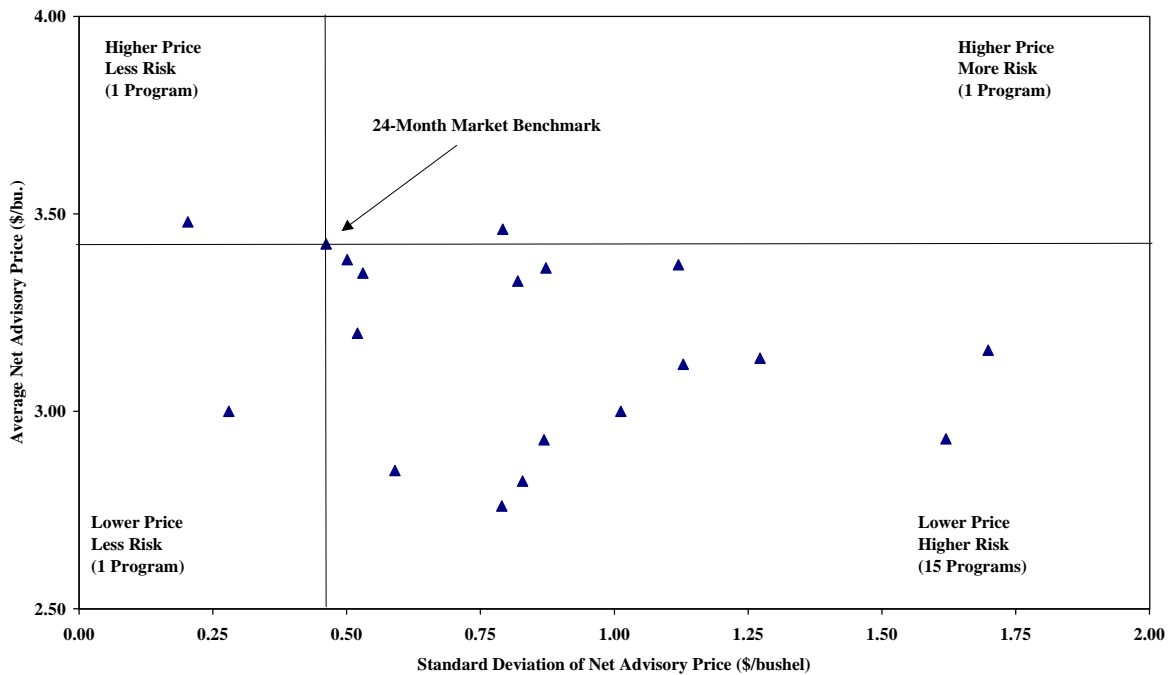


Figure 26. Average Net Advisory Revenue and Standard Deviation for 18 Market Advisory Programs, Wheat Revenue, 1995-1998, 24-Month Benchmark

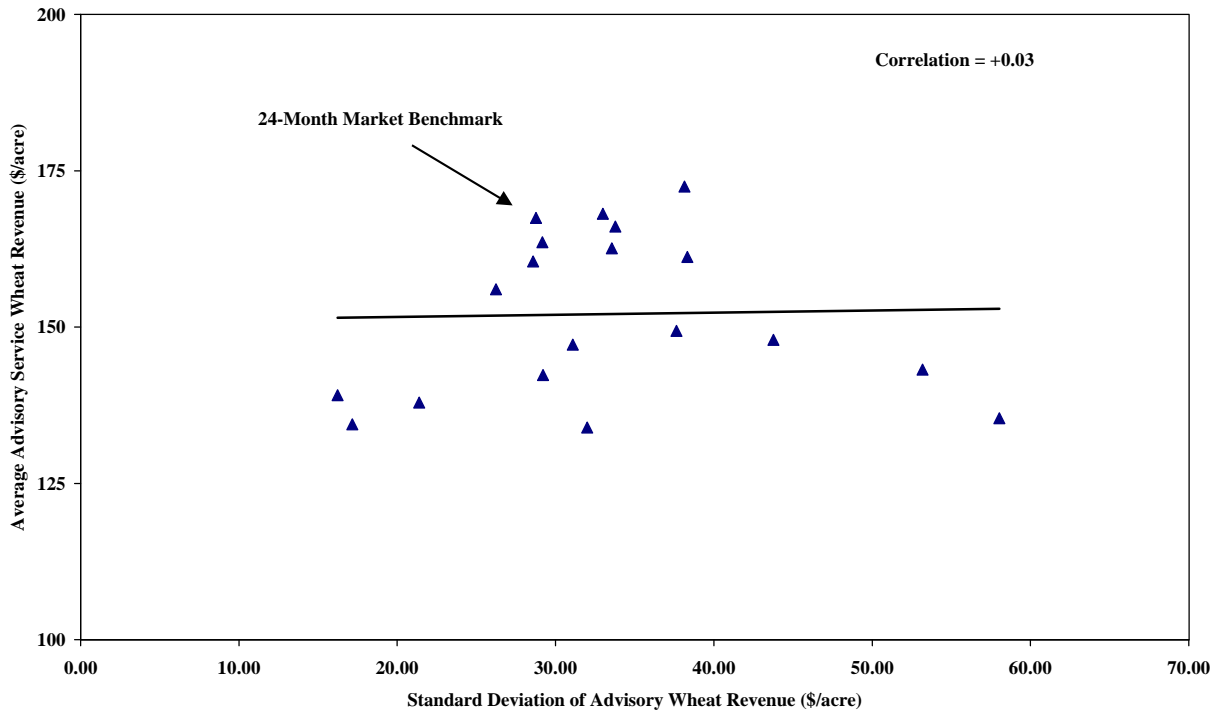


Figure 27. Pricing Performance and Risk of 18 Market Advisory Programs Relative to the Market Benchmark, Wheat Revenue, 1995-1998, 24-Month Benchmark

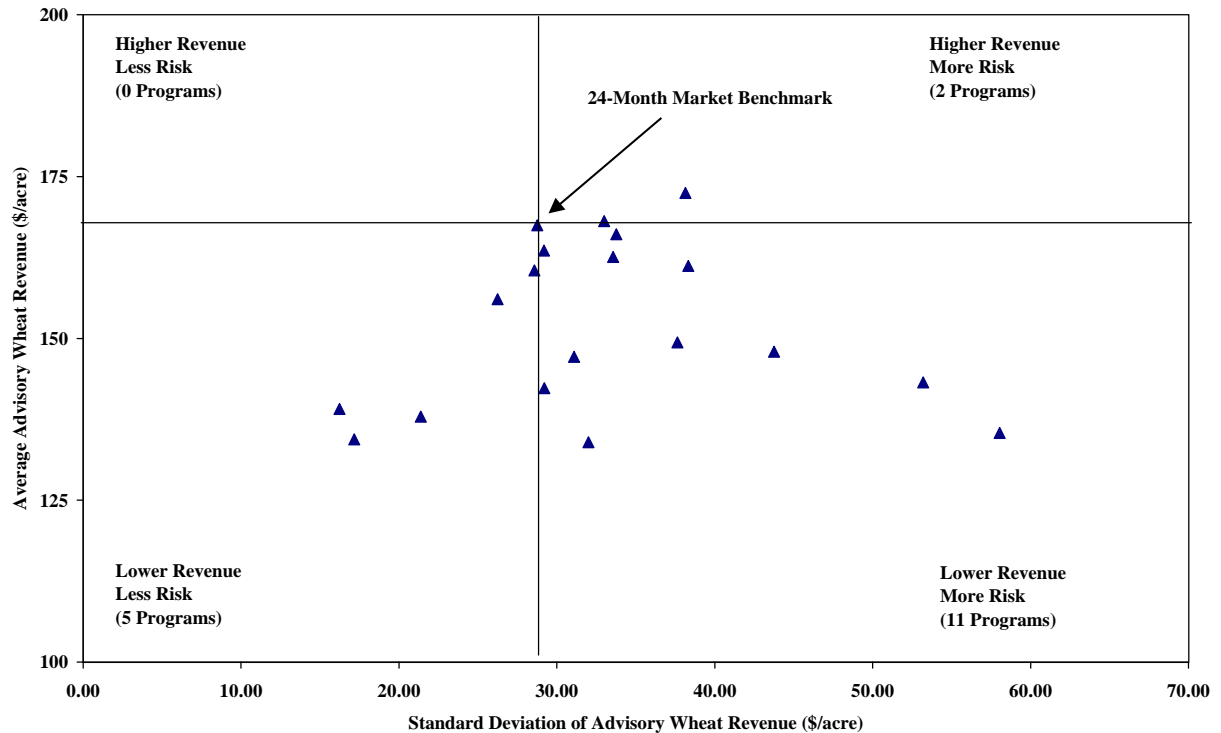


Figure 28. Average Net Advisory Price and Standard Deviation for 18 Market Advisory Programs, Wheat Price, 1995-1998, 20-Month Benchmark

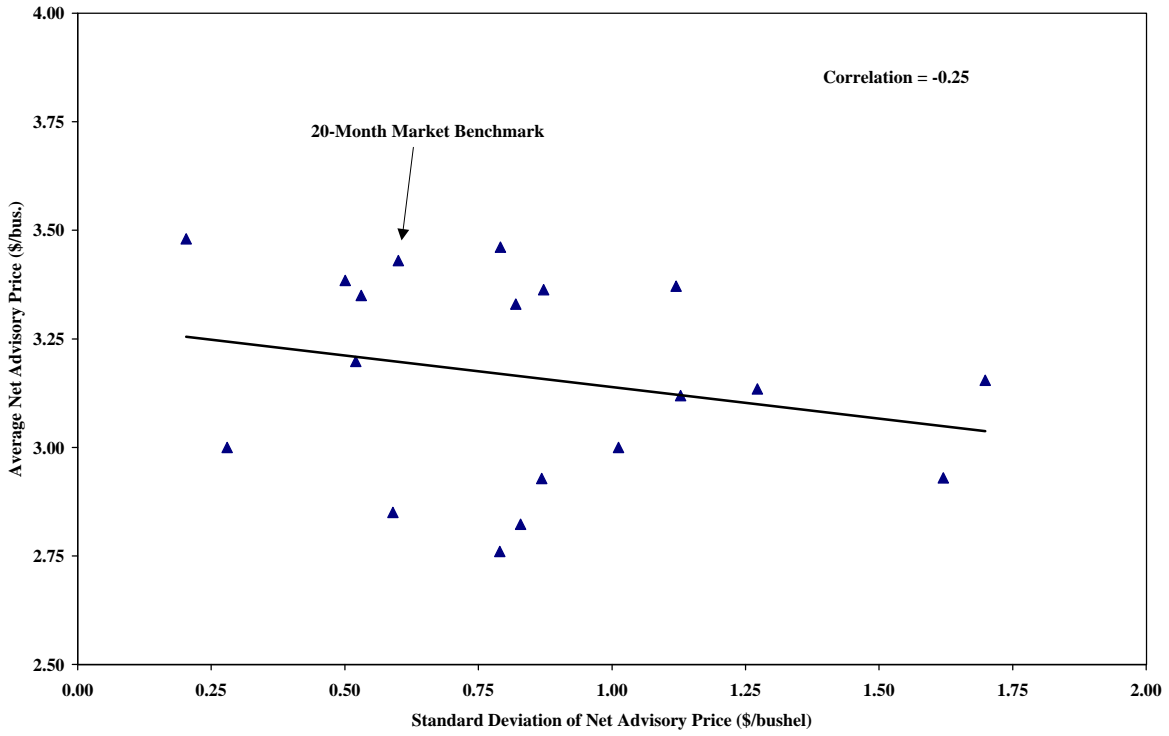


Figure 29. Pricing Performance and Risk of 18 Market Advisory Programs Relative to the Market Benchmark, Wheat Price, 1995-1998, 20-Month Benchmark

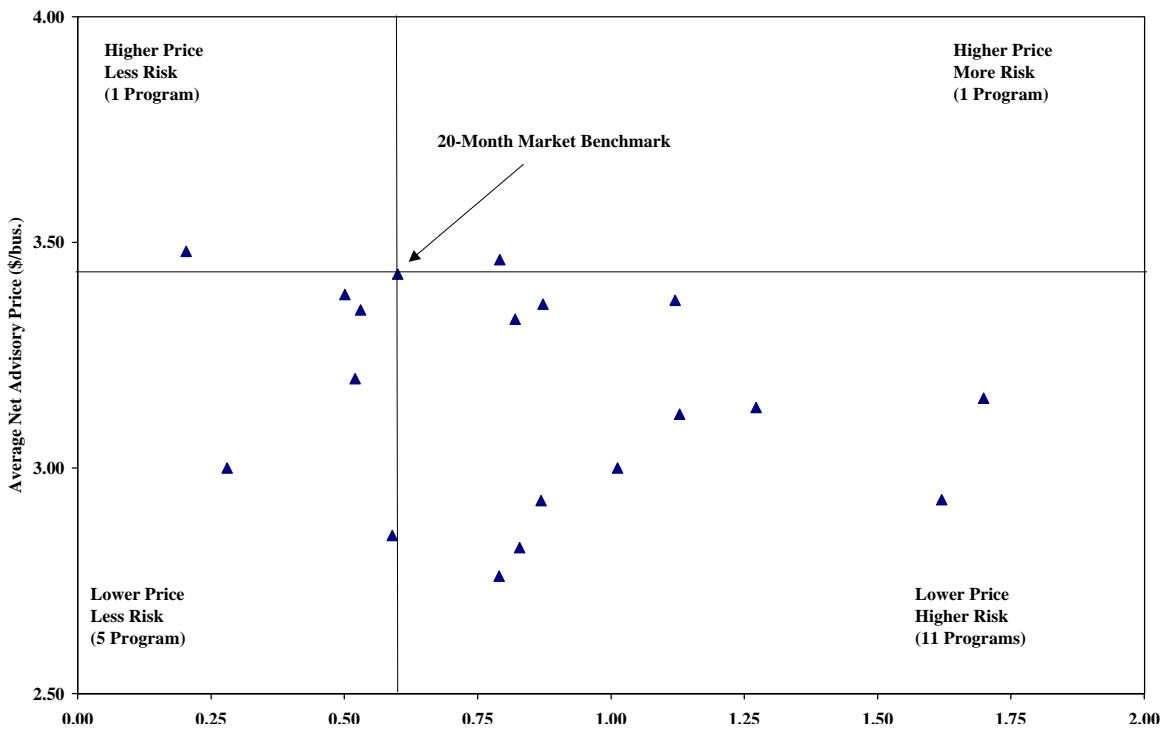


Figure 30. Average Net Advisory Revenue and Standard Deviation for 18 Market Advisory Programs, Wheat Revenue, 1995-1998, 20-Month Benchmark

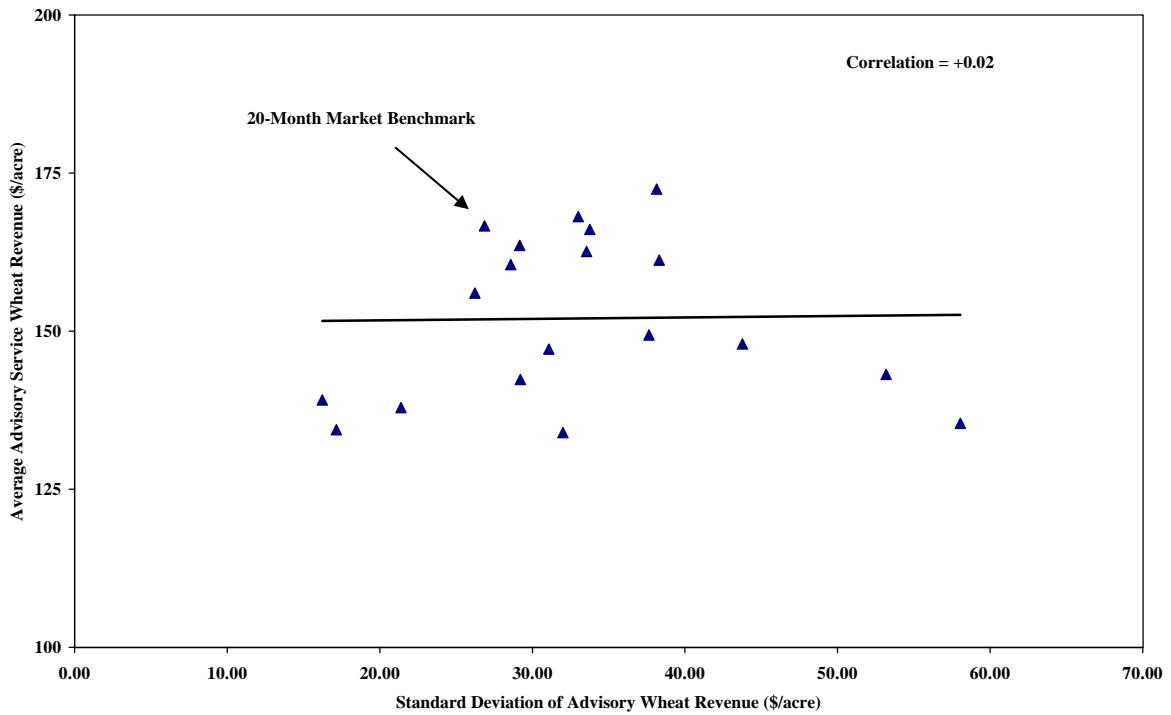


Figure 31. Pricing Performance and Risk of 18 Market Advisory Programs Relative to the Market Benchmark, Wheat Revenue, 1995-1998, 20-Month Benchmark

