The Performance of Agricultural Market Advisory Services in Marketing Wheat

by

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Practitioner's Abstract

The purpose of this paper is to investigate the performance of agricultural market advisory services in marketing wheat. Two key performance questions are addressed: 1) Do market advisory services, on average, outperform an appropriate wheat market benchmark? and 2) Do market advisory services exhibit persistence in their wheat performance from year-to-year? Market advisory service recommendations for wheat are available from the AgMAS Project for the 1995, 1996, 1997 and 1998 marketing years. At least 20 advisory programs are included for each year.

Tests of pricing performance relative to a market benchmark are based on the proportion of programs exceeding the benchmark price and the average percentage difference between the net price of advisory programs and the benchmark price. In statistical terms, the pricing performance test results are clear. Not only do market advisory programs in wheat consistently fail to "beat the market," their performance is significantly worse than the market. The level of under-performance is striking and consistent, with the proportion of programs above market benchmarks for the four-year period ranging from 0.34 to 0.38. Estimates of the four-year average return relative to market benchmarks range from –9.61 to –10.48 percent.

Tests of predictability are based on the correlation of performance measures for overlapping and non-overlapping adjacent marketing years. In general, the predictability results provide little evidence that future advisory program pricing performance can be usefully predicted from past performance. On average, correlations are positive for overlapping years (e.g. 1995 vs. 1996). However, correlations tend to be negative for non-overlapping years (e.g. 1995 vs. 1997), which implies that producers selecting top-performing programs based on a given year, and expecting them to continue to be top-performing funds, would actually experience just the opposite result.

Keywords: *wheat, market advisory service, benchmark, market efficiency, pricing performance, predictability*

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Farmers view market advisory services as a significant source of market information and advice in their quest to manage price risks associated with commodity marketing (e.g., Patrick, Musser, and Eckman, 1998; Schroeder, Parcell, Kastens and Dhuyvetter, 1998; Norvell and Latz, 1999). Despite their popularity among farmers, there is only limited evidence regarding the performance of market advisory services.

Gehrt and Good (1993) analyze the performance of five advisory services for corn and soybeans over 1985-1989. Martines-Filho (1996) examines the pre-harvest corn and soybean marketing recommendations of six market advisory services over 1991-1994. Most recently, Irwin, Jackson, Good and Martines-Filho (2000) investigate the performance of 25 advisory services in marketing corn and soybeans over 1995-1998. The evidence in these three studies suggests a modest ability to "beat the market."

This discussion points to a need for further research on the performance of market advisory services. Previous studies only examine advisory service performance in marketing corn and soybeans. It is not known whether the results generalize to other commodities with different production and consumption characteristics. Wheat represents an interesting additional market to examine advisory service performance. It differs significantly from corn and soybeans with respect to the timing and location of production, yield growth trends, seasonality and consumption uses. Hence, we would expect different marketing patterns, and potentially, different results than have been reported for corn and soybeans.

The purpose of this paper is to investigate the performance of agricultural market advisory services in marketing wheat. Following Irwin, Jackson, Good and Martines-Filho (2000) two key performance questions will be addressed: 1) Do market advisory services, on average, outperform an appropriate wheat market benchmark? and 2) Do market advisory services exhibit persistence in their wheat performance from year-to-year? The data for the study is provided by the Agricultural Market Advisory Service (AgMAS) Project, which has been collecting wheat track records for at least 21 advisory services since September 1994. At the present time, track records are available for the 1995, 1996, 1997 and 1998 marketing years. Since the AgMAS Project subscribes to all of the services and collects "real-time" recommendations, the data are not subject to survivorship bias. The availability of only four marketing years is a limitation of the proposed analysis, but the time period considered does include years of rapidly increasing and decreasing wheat prices.

The procedure used to compute net wheat prices for each advisory service is similar to the procedure used in earlier AgMAS corn and soybean evaluations (e.g., Good, Irwin, Jackson, Jirik and Martines-Filho, 2000). In particular, after the stream of recommendations is collected for a given commodity in a particular marketing year, the net price that would have been received by a wheat producer that precisely follows the set of marketing recommendations is computed. This net price is the weighted average of the cash sale price plus or minus gains/losses associated with futures and options transactions. Brokerage costs are accounted for, as are storage costs.

Tests of performance relative to a benchmark will be based on the proportion of services exceeding the benchmark wheat price and the average percentage difference between the net wheat price of services and the benchmark price. Tests of predictability will be based on the year-to-year correlation of advisory service ranks, wheat prices and percentage differences from the benchmark. In addition, predictability will be examined for advisory services in different performance quantiles.

Data on Advisory Service Recommendations

The market advisory services included in this study do not comprise the population of market advisory services available to farmers. 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 a sample of services for the AgMAS Project, criteria are developed to define an agricultural market advisory service and a list of services is assembled.

The first criterion used to identify services is that a service has to provide marketing advice to farmers. 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 farmers 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.

The original sample of market advisory services that met the two criteria were 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.[1, 2] 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 cross-checked 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 services was (and remains) generally representative of the majority of advisory services available to farmers.

The sample for 1995 includes 24 market advisory programs for wheat. For a variety of reasons, deletions and additions to the 1995 sample occur over time.[3] In 1996, the total number of advisory programs is 23, while in 1997 the total is 20. In 1998, the total number of advisory programs increases by one, to 21. The term "advisory program" is used because several advisory services have more than one distinct marketing program. A directory of the advisory services included in the study can be found at the AgMAS Project website (http://web.aces.uiuc.edu/farm.doc/agmas/).

As mentioned earlier, sample selection biases may plague advisory service databases. The first form is survival bias, which occurs if only advisory services 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" (Brown, Goetzmann, Ibbotson, and Ross, 1992). This form of bias should not be present in the AgMAS database of advisory services because all services ever tracked are included in the sample. The second and more subtle form of bias is hindsight bias, which occurs if data from prior periods are "back-filled" at the point in time when an advisory service is added to the database. Statistically, this has the same effect as survivorship bias because data from surviving advisory services is back-filled. This form of bias should not be present in the AgMAS database because recommendations are not back-filled when an advisory service is added. Instead, recommendations are collected only for the marketing year *after* a decision has been made to add an advisory service to the database.

The actual daily process of collecting recommendations for the sample of advisory services begins with the purchase of subscriptions to each of the services. Staff members of the AgMAS Project read the information provided by each advisory service on a daily basis. The information is received electronically, via DTN, websites or email. For the services that provide two daily updates, typically in the morning and at noon, information is read in the morning and afternoon. In this way, the actions of a farmer-subscriber are simulated in "real-time."

The recommendations of each advisory service are recorded separately. 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 farmers who only wish to make cash sales.[4] In this situation, both strategies are recorded and treated as distinct strategies to be evaluated.[5]

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 year, it is confirmed whether cash sales total exactly 100 percent, all futures positions are offset, and all options positions are offset or expire worthless.

Calculation of Net Advisory Service Prices

At the end of each marketing year, all of the (filled) recommendations are aligned in chronological order. The advice for a given marketing year is considered to be complete for each advisory program when cumulative cash sales of the commodity reach 100 percent, all open futures positions covering the crop are offset, all open option positions covering the crop are either offset or expired, and the advisory program discontinues giving advice for that crop year. The 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 simulate a consistent and comparable set of results across the different advisory services, certain explicit assumptions are made. These assumptions are intended to accurately depict marketing conditions for a representative farm. An overview of the simulation assumptions is presented below. Complete details of the simulation assumptions can be found in Jirik, Irwin, Good, Jackson and Martines-Filho (2000).

An issue of first importance is the appropriate class of wheat and location of production to use in the simulation. In the US, six major classes of wheat are grown over a wide geographic area: hard red winter, soft red winter, hard red spring, durum, hard white and soft white. The simulation for this study is designed to reflect conditions facing a representative soft red winter wheat producer in southwest Illinois. Whenever possible, data is 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). For ease of reading, this area will be referred to in the remainder of this paper 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. The programs included in this study 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, ii) the programs generally make harvest recommendations for June and early July, the harvest period for winter wheat and iii) the programs that give basis advice generally 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 heavy 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.

An important question is the degree to which performance results based on soft red winter wheat production in the southwest Illinois can be generalized to other classes and locations of wheat production in the US. Factors that would contribute to the sensitivity of the results are differences in basis patterns, the spread between different wheat futures markets, and yield variability. Basis differences and spreads probably would not have a large impact, given the amount of inter-market spread trading and the arbitrage that occurs between the three wheat markets. However, yield variability may have a significant impact, particularly if the focus is on gross revenue per acre instead of net price per bushel. Evidence of this variability is presented in Figure 1, which shows the wheat yield history for the West Southwest Illinois Crop Reporting District, South Central Kansas Crop Reporting District (hard red winter) and Northeast North Dakota Crop Reporting District (hard red spring) over 1972-1998. Figure 2 presents deviations from trend yield regressions and the corresponding correlation coefficients. While overall trends are similar for yields in the different regions, the correlation of yield deviations is close to zero. This suggests caution in generalizing the pricing performance results for southwest Illinois to another wheat class or geographic location.

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 "realistic" time when 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. The most frequent exceptions are when programs have relatively small amounts (20 percent or less) of cash wheat unsold at the end of a window. In such cases, the actual sales recommendations on the indicated dates are recorded.

There are four exceptions to the marketing window that should be highlighted. One program held 1997 wheat far beyond the end of the 1997 marketing window and three programs did the same for 1998 wheat. More specifically, as of October 29, a program had not recommended any cash sales for both the 1997 and 1998 wheat crops, however, both crops were fully hedged using wheat futures. Another program had not sold any of the 1998 wheat crop by this date, and one more program had sold only 25 percent of 1998 wheat. In order to complete the analysis for these programs, the futures positions and all remaining cash quantities are marked-to-the-market as of October 29, 1999 (last business day of October 1999).

The cash price assigned to each cash sale recommendation is the West Southwest Illinois Price Reporting District closing, or overnight, bid. Similarly, the forward contract price assigned to all pre-harvest forward sales is the forward bid for the West Southwest Crop Reporting District. The cash and forward contract data are collected and reported by the Illinois Department of Ag Market News.[6] 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). Futures prices and options premia are Chicago Board of Trade quotes.

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.

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 Figure1, wheat yields in southwest Illinois vary substantially over time. 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 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.

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 10^{th}. Second, if the USDA wheat yield estimate for southwest 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.

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.

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. 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 1995-1998 wheat crops quoted in a telephone survey of southwest Illinois elevators.

The interest charge for storing grain is the interest rate compounded daily from the end of wheat harvest to the date of sale. The interest rate used is the average rate for all commercial agricultural loans for the third quarter of the harvest year as reported in the *Agricultural Finance Databook* published by the Board of Governors of the Federal Reserve Board. This interest rate has been around 9 percent per year for the four years of this study.

Finally, the price of wheat is below the loan rate during significant periods of time in the 1998-1999 marketing year, so that use of the marketing loan program is an important part of marketing strategies during this period. 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. 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. Further information on the decision rules used to implement marketing loan recommendations can be found in Jirik, Irwin, Good, Jackson and Martines-Filho (2000).

Market Benchmark

Simply comparing the net price received across advisory services will not answer the question of whether advisory services as a group enhance the income of farm subscribers. Instead, a comparison to a benchmark price (or prices) is needed to evaluate the performance of advisory services relative to pricing opportunities offered by the market. In the stock market, mutual funds are evaluated with respect to market benchmark performance criteria (e.g., Bodie, Kane, and Marcus, 1989). These benchmarks typically are indexes of stock market returns over the period of evaluation, e.g., the Dow Jones Industrial Average and Standard and Poor's 500.

The selection of a benchmark for advisory service performance evaluations is examined in a study by Good, Irwin and Jackson (1998). They argue that the most appropriate market benchmark is the average price over the entire, relevant marketing horizon. Applied to wheat, the marketing window for a given crop spans two calendar years, beginning on the first business day of June in the year prior to harvest, and extends through the last business day of May in the year after harvest. Hence, the market benchmark is calculated as the average of the daily southwest-Illinois cash wheat bids available for the two-year marketing window. Pre-harvest cash prices represent cash-forward bids for harvest delivery in southwest-Illinois, while daily spot prices for southwest-Illinois are used for the post-harvest period.

Three 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. The daily weighting factors for pre-harvest prices in normal years are based on the calculated trend yield, while the weighting of the post-harvest prices is based on the actual reported yield for central Illinois. In short-crop years, yield expectations are updated with the release of the USDA May *Crop Production Report*, using the same procedure applied to advisory program recommendations. 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.

A third adjustment to the average cash price benchmark is made only for 1998. This adjustment is based on the logic that a "prudent" or "rational" producer will take advantage of the price protection offered by the marketing loan program when following the benchmark average price strategy. Based on this argument, the average cash price benchmark is adjusted by the addition of marketing loan benefits. Bushels marketed in the pre-harvest period according to the benchmark strategy (approximately 53 percent) are treated as forward contracts with the benefits assigned at harvest. Bushels marketed each day in the post-harvest period (approximately 47 percent) are awarded marketing loan benefits in existence for that particular day.

In order to test the sensitivity of performance results to the choice of market benchmark, two alternative versions of the previous average cash price benchmark also are considered in the analysis. The first alternative 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, this alternative benchmark places more weight on post-harvest prices than pre-harvest prices. The second alternative benchmark averages prices only for a 16-month marketing year, which excludes prices previous to February.

Statistical Tests of Market Advisory Service Pricing Performance

Two statistical tests are used to test the null hypothesis that average market advisory service pricing performance does not differ from that of the market benchmark.[7] The first test is based on the proportion of services exceeding the benchmark price. This test is considered because it is not influenced by extremely high or low advisory prices. The second test is based on the average percentage difference ("return") between the net price of services and the benchmark price. This test is useful because it takes into account the average magnitude of differences from the benchmark.[8]

Test Statistics

A formal test of the null hypothesis that the proportion of advisory services "beating" the market benchmark is insignificant requires the specification of an appropriate test statistic. Anderson, Sweeney and Williams (1996) show that the sample estimator of the proportion, $\overline{p}$, is distributed binomially with an expected value of p and a standard error of $\sqrt{p(1-p)/n}$, where p is the true value of the proportion in the population and n is the number of sample observations. They also note that the sampling distribution of $\overline{p}$ is approximately normal so long as $np \geq 5$ and $n(1-p) \geq 5$. Since both conditions are met for all of the samples considered here, the normality approximation is invoked. The form of the test statistic based on the above assumptions is $Z = (\overline{p} - p_0) \Big/ \sqrt{p_0(1-p_0)/n}$, where p_0 is the assumed value of p under the null hypothesis. The remaining issue is the expected proportion (p_0) under the null hypothesis. The efficient market hypothesis (Fama, 1970) implies that the expected probability of "beating the market" is the same as the result of flipping a coin and showing heads, or 0.50. Setting $p_0 = 0.50$, the test statistic is $Z = (\overline{p} - 0.50) \Big/ \sqrt{0.25/n}$.

A formal test of the null hypothesis that the average percentage difference between the net price of services and the benchmark price is zero also requires the specification of an appropriate test statistic. First, for a given marketing year and commodity, define the percentage difference for the i^{th} advisory service as $r_i = \ln(NAP_i / BP) \cdot 100$, where NAP_i is the net advisory price for the i^{th} advisory service and BP is the market benchmark price for the same commodity and marketing year. The sampling distribution of $\overline{r} = \frac{1}{n}\sum_{i=1}^{n} r_i$ is well-known and does not need to be described in detail here. The test statistic for a null hypothesis of zero average percentage difference is $t = \overline{r} \Big/ \hat{s} \Big/ \sqrt{n}$ where $\hat{s}$ is the estimated standard deviation of the differences across the n advisory services in the sample. The t-statistic follows a t-distribution with $n-1$ degrees of freedom.

The percentage difference defined above, r_i, can be thought of as the "return" to following the recommendations of a particular market advisory service. This raises the question of whether the calculated "returns" are risk-adjusted. If one is willing to assume that the average risk of advisory services is equal to risk of the market benchmark, then market advisory returns can be considered risk-adjusted returns. This type of approach (risk-matching) is used frequently in studies of returns to strategies in financial markets (e.g. Ritter, 1991). However, since it is difficult to test the appropriateness of this assumption over the short time period considered in this analysis, a risk-adjusted interpretation of advisory returns should be treated cautiously.

Performance Test Results

Table 1 reports results of the proportional test of wheat pricing performance for each year and all four years pooled.[9, 10] Statistical significance is based on a null hypothesis proportion of 0.50, the same as the proportion of heads observed in the flips of a fair coin. Individual year results are somewhat sensitive to the benchmark considered. For example, the proportion of programs above the 24-month benchmark price in 1998 is 0.05 and statistically smaller than 0.50, while the proportion of programs above the 16-month benchmark is 0.33 and insignificantly different from 0.50. However, the proportion pooled across the four years does not vary substantially across the benchmarks, ranging from 0.34 to 0.38. Pooled four-year proportions based on the 24-month and 20-month proportions are significantly different from 0.5

at the one-percent level, while the 16-month benchmark proportion is significant at the five-percent level.

Results for the average return test of pricing performance are reported in Table 2. Individual year and four-year average test results are qualitatively similar to the proportional test results. Point estimates of the four-year average return range from –9.61 to –10.48 percent. All of the four-year average returns are significantly different from zero at the one-percent level. In some individual years the magnitude of underperformance is large. For example, average return estimates for 1997 range from –19.91 to –24.22 percent.

In statistical terms, the pricing performance test results presented in this section are fairly clear. Not only do market advisory programs in wheat consistently fail to "beat the market," their performance is significantly worse than the market. The level of under-performance is striking and consistent. Point estimates of proportions for individual years are equal to or less than 0.5 in ten of twelve test cases. Likewise, point estimates of average return for individual years are negative in ten of twelve test cases.

Given the statistical results summarized above, a relevant question to ask is whether the pricing under-performance of advisory programs also is economically significant. While "economic significance" is a vague concept, it is important nonetheless. Perhaps the best perspective on this question is gained by examining wheat revenue per acre. Averaged across all three benchmarks, wheat revenue for 1995-1998 averages about $167 per acre.[11] This can be compared to the average revenue for the advisory programs across the four years of about $151 per acre. The difference is $16 per acre, which, by any reasonable standard, is an economically non-trivial level of under-performance.[12]

The pricing performance results for wheat stand in sharp contrast to those reported for corn and soybeans. Irwin, Good, Jackson and Martines-Filho (2000) analyze the pricing performance of corn and soybean market advisory programs tracked by the AgMAS Project over 1995-1998. They find that market advisory services in corn and soybeans have a "modest" ability to "beat the market," with combined corn and soybean revenue for the advisory programs averaging about $6 per acre more than benchmark revenue. Two explanations seem plausible for the divergence in results across corn and soybeans and wheat. First, the divergence may simply be an artifact of a relatively small sample of years, where wheat advisory performance is by chance unusually poor and/or corn and soybean advisory performance is unusually good. Second, advisory programs may be more skillfull in analyzing and forecasting corn and soybean prices than wheat prices.

The results of the analysis also have implications for the ongoing debate about market efficiency and risk management strategies in agriculture. One view is that grain markets (cash, futures and options) are not efficient and, therefore, provide opportunities for farmers to systematically earn additional profits through marketing (e.g. Wisner, Blue and Baldwin, 1998). The other view is that grain markets are at least efficient with respect to the type of strategies available to farmers (e.g., Zulauf and Irwin, 1998). Since the returns of wheat advisory programs over 1995-1998 are significantly less than transactions cost, including the cost of the programs, the results are consistent with market efficiency in the sense of Grossman and Stiglitz (1980).[13]

Finally, it is interesting to compare the pricing performance results for market advisory programs in wheat to that of other investment professionals. According to *Morningstar Reports*, only 16 percent of active mutual fund managers beat the returns to a broad stock market average over the last decade (Clements, 1999). By comparison, the performance of agricultural market advisory programs in wheat is a somewhat better, with about one-third of the programs beating the market.

Predictability of Advisory Service Performance

Even if advisory programs as a group generate negative returns, there is a wide range in performance for any given year. For example, wheat net advisory prices for 1997 vary from $1.34 per bushel to $3.90 per bushel. While this example is the most dramatic, the variation across advisors in other years also is substantial. This raises the important question of the predictability of advisory service performance from year-to-year. In other words, is past performance indicative of future results? This issue is addressed by calculating correlation coefficients for measures of advisory service performance across overlapping and non-overlapping pairs of adjacent marketing years. The testing procedures have been widely applied in studies of financial investment performance (Elton, Gruber, and Rentzler, 1987; Irwin, Zulauf and Ward, 1994; Lakonishok, Shleifer and Vishny, 1992). Recent analysis by Brorsen and Townsend (1998) indicates these methods are reasonably powerful in detecting performance persistence if it exists.

The distinction between overlapping and non-overlapping market years is due to the fact that each marketing window is two calendar years in length, and hence, two adjacent marketing windows overlap by one calendar year. This overlap may influence predictability results, in that correlation between overlapping years may be due to "true" persistence in performance or the overlapping nature of the periods of comparison. Correlations for non-overlapping years reflect only "true" persistence in pricing performance.

The first step in predictability analysis is to rank each advisory service in a given year based on net price received. Then the programs are sorted in descending order. For example, the service with the highest net advisory price is ranked number one, and the service with the lowest net advisory price is assigned a number equal to the total number of observations for that commodity in the given year. Finally, the simple (Pearson) correlation coefficient is computed between sorted performance measures for two adjacent marketing years. A significant correlation indicates predictability in returns across years.

Estimated correlation coefficients and tests of significance for overlapping pairs of adjacent marketing years are presented in Table 3.[14, 15] Estimated correlation coefficients for 1995 vs. 1996 and 1996 vs. 1997 are near zero in absolute magnitude and insignificantly different from zero for all three performance measures. In contrast, each of the three correlations estimated for 1997 vs. 1998 are relatively large, at about 0.80. All three are significantly different from zero in this case. The net result is a small average correlation coefficient across the three pairs of years, ranging from about 0.20 to 030. Nonetheless, these comparisons suggest some positive consistency of pricing performance in wheat through time.

Estimated correlation coefficients and tests of significance for non-overlapping pairs of adjacent marketing years are presented in Table 4. The results differ sharply from those for overlapping years. All six of the estimated correlations are negative. Most striking is the large absolute magnitude and significance of the correlations for 1995 vs. 1997. These correlations are statistically significant and range between –0.48 and –0.50. The average correlation for the two pairs of non-overlapping years ranges from –0.36 to –0.40.

The practical implications of positive correlations for overlapping years and negative correlations for non-overlapping years are striking. Consider the case of a producer who uses 1995 performance results to select a top-performing advisory program. Since the 1995 marketing window ends on May 31, 1996, halfway through the 1996 marketing window and one day before the beginning of the 1997 marketing window, the producer could fully implement their choice of advisory program only for the 1997 crop. However, as the non-overlapping correlations in Table 4 show, the top-performing advisory programs in 1995 tend to be the bottom-performing programs in 1997, just the opposite of what the producer expected. A similar result occurs for selections based on 1996 performance results.

While the correlation analysis does not appear to find predictability in advisory service performance across all advisory services, it is possible that sub-groups of advisory services may exhibit predictability. In particular, predictability may only be found at the extremes of performance. That is, only top-performing services in one year may tend to perform well in the next year, or only poor-performing services may perform poorly in the next year. To examine this form of predictability, market advisory programs are grouped according to performance in one marketing year, and their average performance in a subsequent marketing year is evaluated. Specifically, the selection strategy consists of sorting programs by pricing performance in the first year of the pair (e.g., t = 1995) and grouping programs by quantiles (thirds and fourths). Next, the average pricing performance for each quantile is computed for the first year of the pair. Then, the average pricing performance of the quantiles formed in the first year is computed for the second year of the pair (e.g., $t+1$ = 1996).

Average quantile results for wheat market advisory programs between pairs of overlapping marketing years (1995 vs. 1996, 1996 vs. 1997 and 1997 vs. 1998) are presented in Table 5. In terms of rank, there is no evidence that either top- or bottom-performing programs persist in their performance, even for overlapping years. Some evidence of positive predictability is found when price or returns is examined. For example, the top third of programs in year t have an average price of $3.06 per bushel in year $t+1$, whereas the bottom third have an average price of $2.81 in year $t+1$. A similar spread between average prices is found when top and bottom fourths are compared. It is worth noting that both the top third and top fourth of advisory programs generate average returns that are substantially negative in year $t+1$. In other words, even the "best" programs based on past performance under-perform the market by a substantial margin.

Average quantile results for wheat market advisory programs between pairs of non-overlapping marketing years (1995 vs. 1997 and 1996 vs. 1998) are presented in Table 6. Whereas positive persistence tends to be observed for quantiles in overlapping years, a strong tendency of negative persistence is found for non-overlapping years. That is, top performing programs in year *t* tend to be bottom-performing programs in year *t+2*, and vice versa. This holds whether rank, price or return is considered. The magnitude of these reversals is quite striking. For example, the top fourth of advisory programs in year *t* have an average net price in year *t+2* of $2.10 per bushel compared to $2.65 per bushel for the bottom fourth, a spread of over fifty cents per bushel. Once again, the practical implication is that farmers selecting advisory programs based on evidence of positive persistence in overlapping years, would actually experience performance just the opposite of that expected when the strategy is implemented in non-overlapping years.

Overall, the results presented in this section provide little evidence that future advisory program performance can be usefully predicted from past performance. This conclusion does not mean it is impossible to predict advisory service performance. There may be other variables associated with performance that can be used for prediction. For example, Chevalier and Ellison (1999) study whether mutual fund performance is related to characteristics of fund managers that indicate ability, knowledge or effort, and find that managers who attended higher-SAT undergraduate institutions generate systematically higher returns. Barber and Odean (2000) examine the trading records of individual stock investors and report that frequent trading substantially depresses investment returns. Similar factors, such as education of advisors, cash only programs versus futures and options programs, frequency of futures and options trading, or storage costs, may be useful in predicting the performance of agricultural market advisory programs.

Summary

Farmers view market advisory services as a significant source of market information and advice in their quest to manage price risks associated with commodity marketing. Previous studies only examine advisory service performance in marketing corn and soybeans. It is not known whether the results generalize to other commodities with different production and consumption characteristics. Wheat represents an interesting additional market to examine advisory service performance. It differs significantly from corn and soybeans with respect to the timing and location of production, yield growth trends, seasonality and consumption uses. Hence, we would expect different marketing patterns, and potentially, different results than have been reported for corn and soybeans.

The purpose of this paper is to investigate the performance of agricultural market advisory services in marketing wheat. Two key performance questions are addressed: 1) Do market advisory services, on average, outperform an appropriate wheat market benchmark? and 2) Do market advisory services exhibit persistence in their wheat performance from year-to-year? Market advisory service recommendations for wheat are available from the AgMAS Project for the 1995, 1996, 1997 and 1998 marketing years. At least 20 advisory programs are included for each year. While the sample of advisory services is non-random, it is constructed to be generally representative of the majority of advisory services available to farmers.

Tests of pricing performance relative to a market benchmark are based on the proportion of programs exceeding the benchmark price and the average percentage difference between the net price of advisory programs and the benchmark price. In statistical terms, the pricing performance test results are clear. Not only do market advisory programs in wheat consistently fail to "beat the market," their performance is significantly worse than the market. The level of under-performance is striking and consistent, with the proportion of programs above market benchmarks for the four-year period ranging from 0.34 to 0.38. Point estimates of the four-year average return relative to market benchmarks range from –9.61 to –10.48 percent.

Given the statistical results summarized above, a relevant question to ask is whether the pricing under-performance of advisory programs also is economically significant. Perhaps the best perspective on this question is gained by examining wheat revenue per acre. Averaged across all three benchmarks, wheat revenue for 1995-1998 averages about $167 per acre.[16] This can be compared to the average revenue for the advisory programs across the four years of about $151 per acre. The difference is $16 per acre, which, by any reasonable standard, is an economically non-trivial level of under-performance.

The pricing performance results for wheat stand in sharp contrast to those reported for corn and soybeans. Irwin, Good, Jackson and Martines-Filho (2000) find that market advisory services in corn and soybeans have a "modest" ability to beat the market, with combined corn and soybean revenue for the advisory programs averaging about $6 per acre more than benchmark revenue. Two explanations seem plausible for the divergence in results across corn and soybeans and wheat. First, the divergence may simply be an artifact of a relatively small sample of years, where wheat advisory performance is by chance unusually poor and/or corn and soybean advisory performance is unusually good. Second, advisory programs may be more skillfull in analyzing and forecasting corn and soybean prices than wheat prices.

Tests of predictability are based on the correlation of performance measures for overlapping and non-overlapping adjacent marketing years. In general, the predictability results provide little evidence that future advisory program pricing performance can be usefully predicted from past performance. On average, correlations are positive for overlapping years (e.g. 1995 vs. 1996). However, correlations tend to be negative for non-overlapping years (e.g. 1995 vs. 1997), which implies that producers selecting top-performing programs based on a given year, and expecting them to continue to be top-performing funds, would actually experience just the opposite result.

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Endnotes

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

[2] This assumption subsequently is relaxed 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.

[3] 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 Service 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 previous reports, 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.

[4] 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.

[5] There are a few instances where a service clearly differentiates strategies based on the availability of on-farm versus off-farm (commercial) storage. In these instances, recorded recommendations reflect the off-farm storage strategy. Otherwise, services do not differentiate strategies according to the availability of on-farm storage.

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

[7] The two tests of performance are applied to both net advisory prices and net advisory revenue per acre. The results are qualitatively similar for price and revenue. Due to space considerations, only the price results are reported.

[8] An important issue is whether the sample observations on net advisory price are independent, both within and across years. The most likely form of dependence is positive correlation, which, if ignored, would cause sample standard deviation estimates across advisory services to be understated. This in turn would cause the statistical significance of hypothesis test results to be overstated. Several possible forms of dependence are tested and rejected.

[9] The net advisory prices are those presented in Jirik, Irwin, Good, Jackson and Martines-Filho (2000). Complete details regarding the components of the net prices (futures and options gains and losses, net cash price, etc.) can be found in this study.

[10] From this point forward, the term "marketing year" or "year" refers to the marketing window for a particular crop year. This is done to simplify the presentation of results. It is useful to remember that a "marketing year" in the context of this research actually represents a two-year marketing window.

[11] The calculation of revenue per acre ignores economies of size that may accrue to larger farms implementing the recommendations. It also ignores contract "lumpiness" problems that may be significant for smaller farms.

[12] This comparison is not substantially affected by the exclusion of the cost of the programs. Good, Irwin, Jackson, Jirik and Martines-Filho (2000) report that the average cost of the programs is $295 per year. For a 1,000 acre wheat farm, this translates into an average cost of about 30 cents per acre. Put in different terms, this is roughly equal to the average benchmark revenue from two acres of wheat over 1995-1998.

[13] As noted earlier, adding the subscription cost of services to the transactions costs considered in computing net advisory prices does not alter the performance results.

[14] Return correlations also are calculated using 20-month and 16-month benchmarks. Results are similar to the 24-month benchmark return correlations and are not presented due to space considerations.

[15] Bartlett's approximation for the standard error ($1/\sqrt{n}$) of the Pearson correlation coefficient (*r*) is employed. The test statistic $Z = r/\sqrt{n}$ approximately follows a standard, normal distribution.

[16] The calculation of revenue per acre ignores economies of size that may accrue to larger farms implementing the recommendations. It also ignores contract "lumpiness" problems that may be significant for smaller farms.

Table 1. Number of Market Advisory Programs above Alternative Market Benchmark Prices, Wheat, 1995 -1998

Market Benchmark/ Sample Period	Number of Advisory Programs	Number of Programs above Benchmark	Proportion of Programs above Benchmark	*Z* -statistic	Two-tail *p*- value
24-Month Average					
1995	24	16	0.67	1.63	0.102
1996	23	9	0.39	-1.04	0.297
1997	20	4	0.20	-2.68	0.007 ***
1998	21	1	0.05	-4.15	0.000 ***
1995-1998	88	30	0.34	-2.98	0.003 ***
20-Month Average					
1995	24	14	0.58	0.82	0.414
1996	23	7	0.30	-1.88	0.061 *
1997	20	5	0.25	-2.24	0.025 **
1998	21	5	0.24	-2.40	0.016 **
1995-1998	88	31	0.35	-2.77	0.006 ***
16-Month Average					
1995	24	12	0.50	0.00	1.000
1996	23	7	0.30	-1.88	0.061 *
1997	20	7	0.35	-1.34	0.180
1998	21	7	0.33	-1.53	0.127
1995-1998	88	33	0.38	-2.35	0.019 **

Note: Three stars indicates significance at the 1% level, two stars indicates significance at the 5% level, and one star indicates significance at the 10% level.

Table 2. Average Returns Above Alternative Market Benchmark Prices for Market Advisory Programs, Wheat, 1995 - 1998

Market Benchmark/ Sample Period	Number of Advisory Programs	Average Return above Benchmark Price	Standard Deviation	*t*-statistic	Two-tail *p*-value	
		---percent---				
24-Month Average						
1995	24	4.41	12.96	1.67	0.11	
1996	23	-4.47	14.17	-1.51	0.14	
1997	20	-24.22	28.26	-3.83	0.00	***
1998	21	-21.02	16.91	-5.70	0.00	***
1995 - 1998	88	-10.48	21.82	-4.51	0.00	***
20-Month Average						
1995	24	0.53	12.96	0.20	0.84	
1996	23	-7.40	14.17	-2.50	0.02	**
1997	20	-20.97	28.26	-3.32	0.00	***
1998	21	-15.69	16.91	-4.25	0.00	***
1995 - 1998	88	-10.30	20.08	-4.81	0.00	***
16-Month Average						
1995	24	-4.69	12.96	-1.77	0.09	*
1996	23	-7.36	14.17	-2.49	0.02	**
1997	20	-19.91	28.26	-3.15	0.01	***
1998	21	-7.89	16.91	-2.14	0.05	**
1995 - 1998	88	-9.61	19.19	-4.70	0.00	***

Note: Three stars indicates significance at the 1% level, two stars indicates significance at the 5% level, and one star indicates significance at the 10% level.

Table 3. Correlation of Market Advisory Program Performance Between Pairs of Overlapping Marketing Years, Wheat, 1995-1998

	Paired Years				
Correlation Measure	**1995 vs. 1996**	**1996 vs. 1997**	**1997 vs. 1998**		**Average**
Rank Correlation	0.15	-0.06	0.83	***	0.31
	[0.516]	[0.792]	[0.000]		
Net Price Correlation	0.08	-0.21	0.82	***	0.23
	[0.724]	[0.396]	[0.000]		
Return Correlation	0.06	-0.22	0.81	***	0.22
	[0.803]	[0.364]	[0.000]		

Note: Three stars indicates significance at the 1% level, two stars indicates significance at the 5% level, and one star indicates significance at the 10% level. Return correlations are based on the 24-month average cash price benchmark. Figures in brackets are two-tailed *p* -values.

Table 4. Correlation of Market Advisory Program Performance Between Pairs of Non-Overlapping Marketing Years, Wheat, 1995-1998

	Paired Years			
Correlation Measure	**1995 vs. 1997**		**1996 vs. 1998**	**Average**
Rank Correlation	-0.48	**	-0.31	-0.40
	[0.042]		[0.203]	
Net Price Correlation	-0.50	**	-0.24	-0.37
	[0.035]		[0.322]	
Return Correlation	-0.49	**	-0.22	-0.36
	[0.039]		[0.361]	

Note: Three stars indicates significance at the 1% level, two stars indicates significance at the 5% level, and one star indicates significance at the 10% level. Return correlations are based on the 24-month average cash price benchmark. Figures in brackets are two-tailed *p* -values.

Table 5. Predictability of Market Advisory Program Performance by Quantiles Between Pairs of Overlapping Marketing Years, Wheat, Average for 1995 vs. 1996, 1996 vs. 1997 and 1997 vs. 1998

Performance Quantile	**Average Rank**		**Average Price**		**Average Return**	
in Year *t*	**Year *t***	**Year *t* +1**	**Year *t***	**Year *t* +1**	**Year *t***	**Year *t* +1**
			---$/bushel---		---percent---	
Top Third	4	10	4.02	3.06	10.35	-12.08
Middle Third	11	10	3.48	2.86	-5.12	-19.12
Bottom Third	18	11	2.88	2.81	-26.48	-21.20
Top Fourth	3	10	4.11	3.10	12.72	-11.37
Second Fourth	8	11	3.69	2.86	1.71	-19.20
Third Fourth	13	11	3.30	2.91	-10.89	-16.47
Bottom Fourth	18	11	2.80	2.80	-29.43	-21.81

Note: The selection strategy consists of sorting programs by pricing performance in the first year of the pair (e.g., *t* = 1995) and grouping programs by quantiles (thirds and fourths). Next, the average pricing performance for each quantile is computed for the first year of the pair. Then, the average pricing performance of the quantiles formed in the first year is computed for the second year of the pair (e.g., *t+1* = 1996). Returns are based on the 24-month average cash price benchmark.

Table 6. Predictability of Market Advisory Program Performance by Quantiles Between Pairs of Non-Overlapping Marketing Years, Wheat, Average for 1995 vs. 1997 and 1996 vs. 1998

Performance Quantile	**Average Rank**		**Average Price**		**Average Return**	
in Year *t*	**Year *t***	**Year *t* +1**	**Year *t***	**Year *t* +1**	**Year *t***	**Year *t* +1**
			---$/bushel---		---percent---	
Top Third	4	12	4.37	2.19	14.27	-35.73
Middle Third	10	8	3.94	2.58	4.05	-19.17
Bottom Third	17	9	3.38	2.62	-11.75	-16.81
Top Fourth	3	13	4.46	2.10	16.23	-40.84
Second Fourth	7	11	4.07	2.37	7.32	-27.32
Third Fourth	12	8	3.80	2.69	0.26	-14.21
Bottom Fourth	18	8	3.29	2.65	-14.38	-16.00

Note: The selection strategy consists of sorting programs by pricing performance in the first year of the pair (e.g., t = 1995) and grouping programs by quantiles (thirds and fourths). Next, the average pricing performance for each quantile is computed for the first year of the pair. Then, the average pricing performance of the quantiles formed in the first year is computed for the second year of the pair (e.g., $t+2$ = 1997). Returns are based on the 24-month average cash price benchmark

Figure 1. Wheat Yields for West Southwest Illinois, South Central Kansas, and Northeast North Dakota Crop Reporting Districts from 1972 to 1998

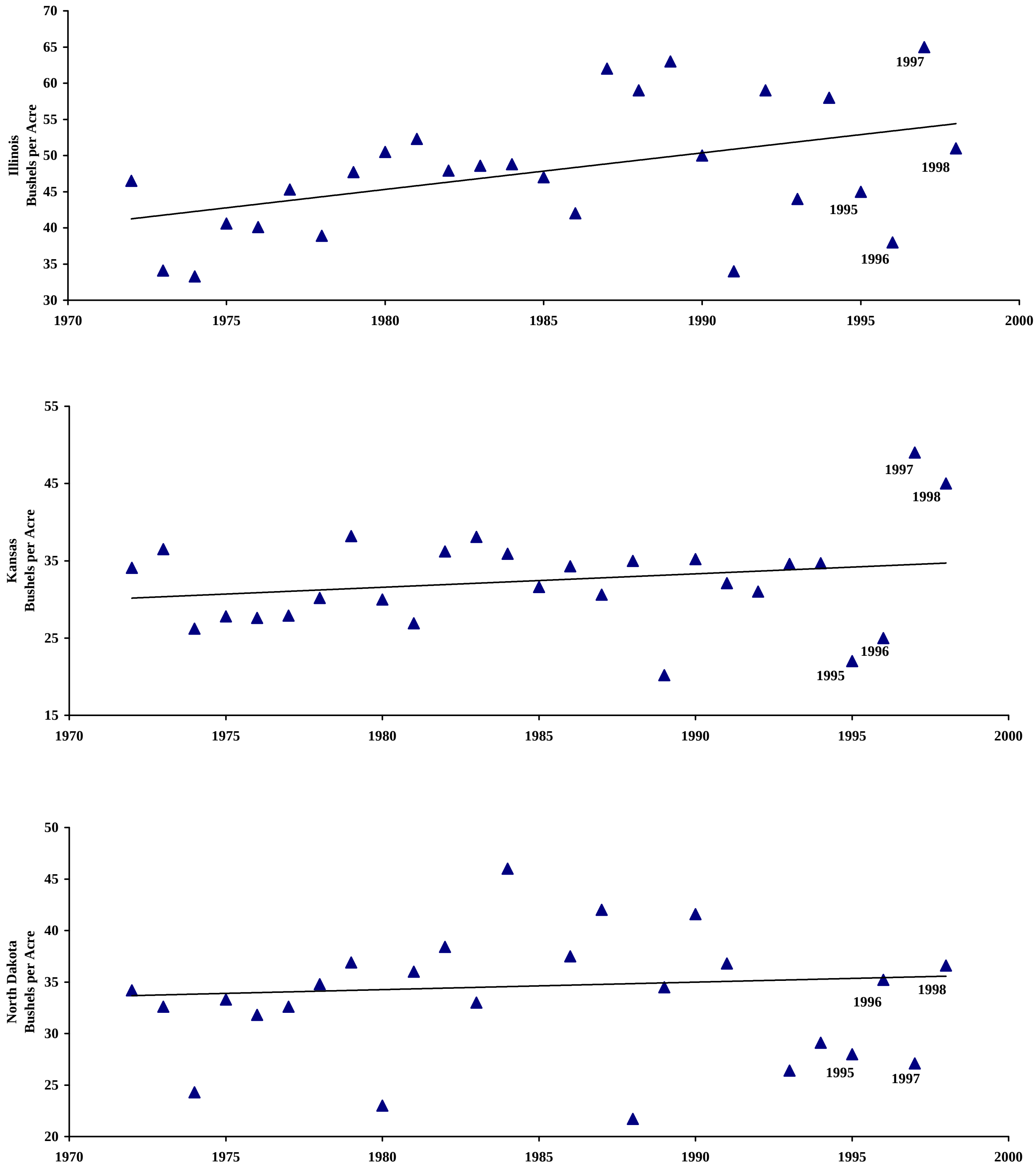

Figure 2. Correlation of Deviation from the Trend Yields in West Southwest Illinois Crop Reporting District versus South Central Kansas and Northeast North Dakota Crop Reporting Districts