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Do Agricultural Market Advisory Services Beat the Market?

Scott H. Irwin, Thomas E. Jackson and Darrel L. Good[1]

Abstract

The purpose of this paper is to address two basic performance questions for market advisory services: 1) Do market advisory services, on average, outperform an appropriate market benchmark? and 2) Do market advisory services exhibit persistence in their performance from year-to-year? Data on corn and soybean net price received for advisory services, as reported by the AgMAS Project, are available for the 1995, 1996 and 1997 marketing years. Performance test results suggest that, on average, market advisory services "beat the market" for the 1995 through 1997 corn and soybean crops. Possible explanations for this result include: i) a unique time period in corn and soybean markets, ii) inefficient commodity markets, iii) the skillfulness of advisory services or iv) a return to risk. The predictability results provide little evidence that advisory service pricing performance can be predicted from year-to-year. When services are grouped by performance quantile, some evidence of predictability is found for the poorest performing services, but not for top performing services.

Introduction

Price risk management is an important business activity for US grain farmers. Using a survey of large-scale, midwestern grain farmers, Patrick and Ullerich (1996) report that price variability is the highest rated source of risk by crop farmers. Given the dramatic fluctuations of grain prices in recent years, it is likely that price variability will continue to be a major source of risk for farmers.

Farmers view market advisory services as a significant source of market information and advice in their quest to manage price risks associated with grain marketing. Patrick and Ullerich (1996) report that the ranking of computerized information services and market advisors is surpassed only by farm records in a rating of seventeen risk management information sources. Patrick, Musser, and Eckman (1998) indicate that 35 and 38 percent of large-scale, midwestern grain farmers used marketing consultants in 1993 and 1994, respectively. Schroeder, Parcell, Kastens and Dhuyvetter (1998) surveyed Kansas crop farmers and report that market advisory services and newsletters are the highest ranked source of information used to formulate price expectations. It is interesting to note that advisory services outranked even futures markets in this survey.

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Given the high value that farmers place upon market advisory services, it is somewhat surprising that only two academic studies investigate the pricing performance of advisory services.[1] The dearth of studies seems even more anomalous in light of the large number of studies on marketing strategies.[2] The lack of studies is most likely due to the difficulty in obtaining data on the stream of recommendations provided by services.

Gehrt and Good (1993) analyze the performance of five advisory services for corn and soybeans over 1985 though 1989. Assuming a representative producer follows the hedging and cash market recommendations for each advisory service, a net price received for each year is computed and compared to a benchmark price. They generally find that corn and soybean farmers obtained a higher price by following the marketing recommendations of advisory services. Martines-Filho (1996) examines the pre-harvest corn and soybean marketing recommendations of six market advisory services over 1991 through 1994. He computes the harvest time revenue that results from a representative farmer following the pre-harvest futures and options hedging recommendations and selling 100 percent of production at harvest. Average advisory service revenue over the four years is larger than benchmark revenue for both corn and soybeans.

While a useful starting point, the two previous studies have important limitations. First, the sample of advisory services examined is quite small. The largest sample includes only six advisory services. Second, the results may be biased due to the nature of the sample selection process. The literature on the performance of mutual funds and investment newsletters highlights the sample selection biases that plague many performance results (e.g. Brown, Goetzmann, Ibbotson, and Ross, 1992; Jaffe and Mahoney, 1998; Metrick, 1999). The most relevant bias for previous studies of market advisory services is survivorship bias, which results from tracking only advisory services that remain in business at the *end* of a sample period.

The previous discussion suggests the academic literature provides farmers with little basis for evaluating and selecting advisory services. In 1994, the Agricultural Market Advisory Service (AgMAS) Project was initiated, with the goal of providing unbiased and rigorous evaluation of market advisory services for crop farmers. Since its inception, the AgMAS Project has been collecting marketing recommendations for about 25 market advisory programs. The AgMAS Project subscribes to all of the services that are followed, and as a result, "real-time" recommendations are obtained. This prevents the data from being subject to survivorship bias.

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 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 the costs of storing any portion of the crop beyond harvest. So far, the AgMAS Project has reported corn and soybean results for the 1995, 1996 and 1997 marketing years. (Good, Irwin, Jackson, and Price, 1997; Jackson, Irwin, and Good, 1998; Jackson, Irwin, and Good, 1999).

The annual AgMAS comparison of net price received for advisory services provides important information that farmers can use in selecting a service. However, the comparisons to date are descriptive only and do not rigorously address the central questions regarding pricing performance. Following the literature on mutual fund and investment newsletter performance (e.g. Jaffe and Mahoney, 1998), the two basic questions that need to be answered are: 1) Do market advisory services, on average, outperform an appropriate market benchmark? and 2) Do market advisory services exhibit persistence in their performance from year-to-year?

The purpose of this paper is to address the previous two questions for corn and soybeans using the net price received reported by the AgMAS Project for the 1995, 1996 and 1997 marketing years. At least 21 advisory services are included in the evaluations for each commodity and marketing 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. The availability of only three marketing years is a limitation of the analysis, but the time period considered does include years of rapidly increasing and decreasing corn and soybean prices.

The tests used to determine average performance of market advisory services and predictability of performance through time have been widely applied in the financial literature (e.g. Elton, Gruber, and Rentzler, 1987; Lakonishok, Shleifer and Vishny, 1992; Irwin, Zulauf, and Ward, 1994; Jaffe and Mahoney, 1998; Metrick, 1999). Tests of performance relative to a benchmark are based on the proportion of services exceeding the benchmark price and the average percentage difference between the net price of services and the benchmark price. Tests of predictability are based on the year-to-year correlation of advisory service ranks, prices and percentage differences from the benchmark. In addition, predictability is examined for advisory services in different performance quantiles.

Data on Advisory Service Recommendations

The market advisory services included in this evaluation do not comprise the entire 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 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 farmers, instead of advice to speculative traders in agricultural commodities. 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. Any discussion of exactly 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 was drawn from the list of "Premium Services" available from the two major agricultural satellite networks, Data Transmission Network (DTN) and FarmDayta.[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 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 original sample for 1995 includes 25 market advisory programs for both corn and soybeans. For a variety of reasons, deletions and additions to the original sample occur over time.[4] In 1996, the total number of advisory programs is 26 for corn and 24 for soybeans, while in 1997 the total is 23 for corn and 21 for soybeans. The term "advisory program" is used because several advisory services have more than one distinct marketing program.[5] A directory of the advisory services included in the study can be found at the AgMAS Project website (http://www.aces.uiuc.edu/~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, web sites, 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.[6] In this situation, both strategies are recorded and treated as distinct strategies to be evaluated.[7]

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 that cash sales total exactly 100%, all futures positions are offset, and all options positions are offset or expire worthless.

Calculation of Net Advisory Service Prices

At the end of a 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%, 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, central-Illinois farm. An overview of the simulation assumptions is presented below. Complete details of the simulation assumptions can be found in Jackson, Irwin and Good (1999).

Marketing Window

A two-year marketing window, spanning September of the year before harvest to August of the year after harvest, is used in the analysis. For example, the 1997 marketing window is September 1, 1996 through August 31, 1998. The beginning date is selected because advisory services in the sample generally begin to make marketing recommendations around this date. The ending date is selected to be consistent with the ending date for corn and soybean marketing

years as defined by the US Department of Agriculture (USDA). There are a few exceptions to the marketing window definition. Several advisory programs have relatively small amounts (10% or less) of cash corn or soybeans unsold as of the end of a window. One marketing program also began pre-harvest hedges prior to September 1, 1996. In these cases, the actual sales recommendations on the indicated dates are recorded.

Prices

The cash price assigned to each cash sale recommendation is the central-Illinois closing, or overnight, bid. The central-Illinois price is the mid-point of the range of bids by elevators in a 25-county area in central and east central-Illinois. The bids are collected and reported by the Illinois Department of Agriculture. The central-Illinois market also is used for cash-forward contract transactions. Futures prices and options premia are Chicago Board of Trade quotes.

Quantity Sold

Since most of the advisory program recommendations are given in terms of the proportion of total production (e.g., "sell 5% of 1997 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 100 bushels, then a recommendation to sell 5% of the corn crop translates into selling 5 bushels. When all of the advice for the marketing year has been implemented, 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. Prior to harvest, the best estimate of the current year's expected yield is a function of yield in previous years. In this study, the assumed yield prior to harvest is based on a linear regression trend yield, while the actual reported yield is used from the harvest period forward.

Brokerage Costs

Brokerage costs are incurred when farmers open or lift positions in futures and options markets. For the purposes of this study, it is assumed that brokerage costs are $50 per contract for a round-turn for futures transactions, and $30 per contract to enter or exit an options position. Further, it is assumed that CBOT corn and soybean futures 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.

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. Carrying charges are assigned from end of the estimated ending point of the harvest window. Physical storage charges are assumed to be a flat 13 cents per bushel from the end of harvest through December 31. After January 1, physical storage charges are assumed to be 2 cents per month (per bushel), with this charge pro-rated to the day when the cash sale is made. The storage costs represent the typical storage charges quoted in a telephone survey of Central-Illinois elevators.

The interest charge for storing grain is the interest rate compounded daily from the harvest mid-point to the date of sale. The interest rate used is the average rate for all commercial agricultural loans for the fourth quarter of the harvest year and the first three quarters of the next calendar 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% per year for the three years of this study.

In addition to the storage and interest costs, another charge is assigned to corn (but not soybeans) that goes into storage. This charge, referred to as a "shrink charge", is commonly deducted by commercial elevators on "dry" corn that is delivered to the elevator to be stored, and reflects a charge for drying and volume reduction (shrinkage) which occurs in drying the corn from (typically) 15% to 14% moisture. The charge for drying is a flat 2 cents per bushel, while the charge for volume reduction is 1.3% per bushel. The charge for this volume reduction is calculated as 1.3% times the average harvest-time cash price for each marketing year. For example, for the 1997 crop the harvest-time cash price was $2.65 per bushel, so the charge for volume reduction was 3.4 cents per bushel ($2.65*1.3%).

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 is needed to evaluate the performance of advisory services relative to pricing opportunities offered by the market. In the stock market, mutual funds can be, and 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 an appropriate benchmark for advisory service performance evaluations is treated thoroughly in a recent report by Good, Irwin and Jackson (1998). They argued that, conceptually, a useful benchmark should: 1) be *simple* to understand and to calculate; 2)

represent the returns to a marketing strategy that could be *implemented* by farmers; 3) be directly *comparable* to the net advisory price received from following the recommendations of a market advisory service; 4) not be a function of the actual recommendations of the advisory services or of the actual marketing behavior of farmers, but rather should be *external* to their marketing activities; and 5) be *stable*, so that it represents the range of prices made available by the market throughout the marketing year instead of representing the price during a small segment of the marketing year. The market benchmark price that Good, Irwin and Jackson argue is the most consistent with the above criteria is the average cash price for corn and soybeans over the entire marketing year. The marketing window used in the AgMAS project for a given crop spans two calendar years, beginning on the first of September in the year prior to harvest, and extends through the end of August in the year after harvest. As its name suggests, it is calculated as the average of the daily central-Illinois cash grain bids available for the two-year marketing window. Pre-harvest cash prices represent cash-forward bids for central-Illinois, while daily spot prices for central-Illinois are used for the post-harvest period.

Two 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. First, instead of taking the simple average of the daily prices, a weighted average price is calculated to account for changing yield expectations. 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 Central-Illinois. The second adjustment to the daily cash prices is to adjust the post-harvest cash prices to a harvest equivalent by subtracting carrying charges. The daily carrying charges are calculated in the same manner as those for the net advisory price. Complete details of the construction of the benchmark price con be found in Good, Irwin and Jackson (1998).

Net Price Received Results for 1995 - 1997

Net price received for the sample of market advisory services for the 1995, 1996, and 1997 marketing years is reported in Tables 1 and 2.[8, 9] Note that some of the marketing programs included in the table are not evaluated for all three years. The three-year averages are calculated only for the 19 marketing programs that are evaluated for all three years.

As shown in Table 1, the average net advisory corn price over the three years for the 19 programs is $2.65 per bushel, which is two cents above the three-year market benchmark price of 2.63. The results range from a low of $2.36 to a high of $3.03. Among the nineteen programs that are evaluated for all three years, eleven achieve an average net advisory price greater than the three-year average market benchmark price. However, only one program achieves a net advisory price that is higher than the market benchmark in all three years of the study. One other program "beats" the market benchmark in 1995 and "ties" the benchmark in both 1996 and 1997.

In looking at the years separately, the average net advisory corn price of $3.03 per bushel for 1995 is 13 cents higher than the market benchmark corn price of $2.90. In 1996 the average

net advisory price is two cents below the market benchmark price, while in 1997 the average net advisory price is one cent below the market benchmark price.

The three-year results for soybeans are listed in Table 2. The three-year average net advisory soybean price is $6.73 per bushel, which is 17 cents above the three-year market benchmark soybean price of $6.56. The results range from a low of $6.37 to a high of $7.27. Only two of the nineteen programs evaluated for all three years achieve an average net advisory price that is less than the three-year average market benchmark price. In addition, eight of these programs "beat" the market benchmark price in all three years of the study.

The average net advisory price is greater than the market benchmark price in each of the three years, although the difference declines over the three years. In 1995 the net advisory soybean price of $6.59 per bushel is 33 cents higher than the market benchmark price of $6.26. In 1996 the average net advisory price is 16 cents above the market benchmark price, while in 1997 the average net advisory price is 10 cents above the market benchmark price.

Since many subscribers to market advisory services produce both corn and soybeans, it also is of interest to examine a combined measure of corn and soybean pricing performance for each market advisory program. One way to aggregate the results is to calculate the per-acre gross revenues implied by the pricing performance results.[10] The per-acre revenue for each commodity is found by multiplying the net advisory price for each market advisory program by the actual central-Illinois corn or soybean yield for each year. A simple average of the two per acre revenues is then taken to reflect a farm that uses a 50/50 rotation of corn and soybeans.

Table 3 contains the per-acre revenue results. In addition to the results for each market advisory program, the average per-acre revenue that would have been realized if a producer receives the market benchmark price each year also is presented. As with Tables 1 and 2, a three-year average is calculated only for programs that were included in the study for all three years. In addition, market advisory programs that provide recommendations for corn but not soybeans (Ag Line by Doane and Allendale futures & options) are not included.

The three-year average revenue per acre for all 19 market advisory programs is $332 per acre, compared with the market benchmark revenue of $327. The three-year average for the individual programs ranges from a low of $312 to a high of $360 per acre. The average advisory revenue is higher than the market benchmark revenue in each of the three years but, as implied by the corn and soybean pricing results, the difference is highest in 1995 and is smaller in 1996 and 1997. In 1995 the average advisory revenue per acre is $319, which is $15 per acre higher than the market benchmark. The difference narrows to $2 per acre in 1996 and $1 per acre in 1997.

In 1995, 19 of the 25 programs evaluated in that year achieve an average per-acre revenue that was higher than the market benchmark. In 1996, 16 of the 24 programs evaluated top the market benchmark, while in 1997, 12 of the 21 programs top the market benchmark. Of

the 19 market advisory programs that are evaluated for all three years, five programs top the market benchmark revenue in each of the three years of the analysis.

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. 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 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.

Before considering the statistical test results, an important issue needs to be explored that may have a substantial impact on the results. The issue is whether the sample observations on net advisory price are independent. The most likely form of any violation 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.

There are several potential ways that independence could be violated in the sample of market advisory service prices. One potential violation is positive correlation of corn pricing performance for a market advisory program in a given year with its soybean pricing performance in the same year. In other words, do services that do well in corn also tend to do well in soybeans in the same year? If so, statistical tests of the aggregate pricing performance of services for both corn and soybeans may overstate the significance of positive or negative performance because the standard deviation across the corn and soybean observations would be understated.

Figure 1 illustrates the correlation of corn and soybean pricing performance within the same year for market advisory services. Pricing performance in a given year is expressed in two ways. First, the rank of each advisory service with respect to the other services is calculated. The services are ranked in descending order. For example, the service with the highest net advisory price is ranked number 1, 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. Second, the performance of the service with respect to the market benchmark price is calculated. The "return" to market advice is calculated as the percentage difference between the net advisory price and the market benchmark price for the commodity. The correlation between the price levels also is reported, although the results of this analysis are similar to those of the analysis of the percentage return.

The correlation results for market advisory corn and soybean pricing performance within the same marketing year are summarized in Table 4. Significant positive correlation between corn and soybean pricing results is found in 1995 and 1997, but not for 1996. This may be due

to the fact that the price patterns for corn and soybeans were quite different for the 1996 crop year, while corn and soybean prices moved (generally) in the same direction during the 1995 and 1997 marketing years. While market advisory programs do not make exactly the same recommendations for corn and soybeans in any given year, there often is a significantly positive correlation in their corn and soybean pricing performance. This suggests it is inappropriate to pool separate corn and soybean pricing results when conducting statistical tests.

A second potential source of dependence is correlation of net advisory prices through time for a given service and commodity. This form of correlation may be exist due to persistence in the performance of advisory services through time (winners continue to win, losers continue to lose). It may also exist due to the overlapping nature of the marketing years; each marketing year is two calendar years long, and each set of contiguous marketing years overlaps by one year. If this correlation through time exists, it would be inappropriate to pool samples of net advisory prices across marketing years for the same reason as discussed above. As will be shown in the following section, this form of correlation generally is quite low, and therefore, it is reasonable to pool net advisory prices across marketing years.

A third potential source of dependence perhaps is less obvious. It is possible that net advisory prices for a given commodity and marketing year are correlated because of the existence of similar programs offered by the same market advisory service. For example, AgriVisor offers four marketing programs, which may not differ substantially in outcomes due to similar methods of analysis and similar underlying strategies. The potential impact of this form of correlation is examined by creating one net advisory price for each of the market advisory firms that offer multiple programs.[11] A single price is computed by averaging net advisory prices across programs for a given year and commodity. Pricing performance results are qualitatively similar to those using the full set of disaggregated advisory prices, suggesting that net prices of advisory programs for the same firm are uncorrelated or no more correlated than net prices from different firms. Hence, use of net advisory prices by program in tests of market performance does not appear to be a substantive problem.

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, $\bar{p}$, 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 $\bar{p}$ 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 $Z = (\bar{p} - p_0)/\sqrt{p_0(1-p_0)/n}$, 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 0.5. Setting $p_0 = 0.5$ the test statistic is $Z = (\bar{p} - 0.5)/\sqrt{0.25/n}$.

Table 5 reports results of the proportional test of pricing performance for each year and when all three years are pooled. The proportion of services above the market benchmark price for corn varies from a low of 0.43 in 1997 to a high of 0.72 in 1995, with an average of just over 0.50. The proportion is significantly different from 0.5 only in 1995 for corn. Proportions are consistently higher for soybeans, with a low of 0.62 in 1997, a high of 0.84 in 1995 and an average of 0.77. Proportions are significantly different from 0.5 in 1995, 1996 and the entire three-year period for soybeans. Overall, the pooled results for the three years in the study indicate no statistical significance for corn, but a high level of significance for soybeans.

Table 5 also reports aggregated corn and soybean pricing performance for the three years. Given the evidence of correlation between the pricing performance of advisory programs in corn and soybeans in the same year, the combined corn and soybean performance of each service is calculated as a single observation. As would be expected, the proportions for gross revenue per acre fall between the numbers for corn and soybeans. Combined corn and soybean performance is found to be statistically significant in 1995 and for the entire three-year period.

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 $\bar{r}$ 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 $t = \bar{r}/\left(\hat{\sigma}/\sqrt{n}\right)$ where $\hat{\sigma}$ 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.

As noted earlier, r_i can be thought of as the "return" to following a 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 such a short time period, a risk-adjusted interpretation of advisory returns should be treated with a good bit of skepticism.

Results for the average return test of pricing performance for each year and for all three years pooled are reported in Table 6. The average return of services above the market benchmark for corn varies from a low of –1.23 percent in 1996 to a high of 3.97 percent in 1995, with an

average of 0.74 percent. The return is significantly different from zero only in 1995 for corn. Returns are consistently higher for soybeans, with a low of 1.54 percent in 1997, a high of 5.03 percent in 1995 and an average of 3.00 percent. Returns are significantly different from zero in 1995, 1996, 1997, and the entire three-year period for soybeans. The same overall conclusions are reached for each commodity as the earlier proportionate test. That is, pooled results for the three years in the study indicate no statistical significance for corn but a high level of significance for soybeans. Also similar to the proportionate test results, the combined corn and soybean revenue analysis finds significantly positive pricing performance in 1995 and for the pooled three-year period of analysis.

In statistical terms, the pricing performance test results presented in this section are fairly clear. Only limited evidence is found regarding the ability of market advisory services to consistently and significantly "beat the market" for corn. There is substantial evidence that market advisory services consistently and significantly "beat the market" in soybeans. When corn and soybeans are combined and gross returns per acre analyzed, it is also found that market advisory services significantly outperform the market.

Given the statistical performance results, the next relevant question to ask is whether the pricing performance of advisory services 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 re-examining returns for gross corn and soybean revenue per acre. For all three marketing years, gross returns averaged 1.84 percent above benchmark revenue. This translates into about $6 per acre.[12] While this level of return is probably best characterized as modest, it also appears to be non-trivial, particularly in comparison to the cost of the services. Jackson, Irwin and Good (1999) report that the average cost of the services is $279 per year. For a 1,000 acre corn and soybean farm, this translates into an average cost of only 28 cents per acre. There are several reasons to be cautious about concluding that advisory returns generate even a "modest" level of economic significance: i) the results are based on a small sample of years, ii) the trend in returns is downward over the sample period, and iii) returns are concentrated in only one market, soybeans.

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 return of advisory services over 1995-1997 significantly exceeds transactions costs, including the cost of the services, the results potentially imply a rejection of market efficiency in the sense of Grossman and Stiglitz (1980).[13] A firm conclusion cannot be reached due to the uncertainties pointed out with respect to economic significance. In addition, there is uncertainty about the appropriate adjustment for risk or a complete accounting of the costs of implementing advisory service recommendations. It may be the case that important costs are ignored, such as search costs, monitoring costs and related management costs. Nevertheless, the performance results suggest market advisory

services, at least to a modest extent, have access to information not available to other market participants and/or superior analytical skills.

Finally, it is interesting to compare the pricing performance results for market advisory services to that of other investment professionals. According to Morningstar Reports, only 16% 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 services is quite strong, with 51 percent of the services beating the market in corn and 77 percent beating the market in soybeans. This divergence may simply reflect a unique time period in corn and soybean markets, relatively less efficient commodity markets, the skillfulness of advisory services, or an inappropriate adjustment for advisory service risk. Determining which explanation is correct will be an important subject for future research as more data on market advisory performance becomes available.

Predictability of Advisory Service Performance

Even if, as a group, advisory services generate positive returns, there is a wide range in performance for any given year. For example, soybean net advisory prices for 1995 vary from $5.71 per bushel to $7.94 per bushel. While this example probably is the most dramatic, the variation across advisors in other cases 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 adjacent marketing years and determining the average performance for services ranked by quantiles in a year subsequent to the initial year. The testing procedure has 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 first test of predictability is based on the correlation between performance measures of individual market advisory programs across pairs of marketing years. The first step in the analysis is to rank each advisory service based on net price received. Then the services are sorted in descending order. For example, the service with the highest net advisory price is ranked number 1, 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 correlation coefficient is computed between the sorted performance measures for two adjacent marketing years. A significant correlation may indicate some predictability in returns across years.

Figure 2 presents a graphical illustration of the correlation across marketing years for corn, both in terms of advisory rank and percentage return above the market benchmark price. Figure 3 shows the same relationships for soybeans. Estimated correlation coefficients and tests of significance are presented in Table 7.[14] For corn, a significant and moderately positive correlation is found in the net advisory price and the percentage return above the benchmark between the 1995 and 1996 marketing years. A positive correlation also is found between the

rank of the services in corn between 1995 and 1996, but it is not statistically significant. Nominally, just the opposite situation occurs for the 1996 and 1997 marketing years, where negative correlations are found for all three performance measures. The net result is an average correlation coefficient across the two pairs of years that is small, about 0.10. Hence, there does not appear to be consistent pricing performance across time in corn for individual advisory services.

Even less evidence of predictability is found for soybeans. All of the estimated correlation coefficients are positive, but only one is significantly different from zero (rank correlation, 1995 vs. 1996). When averaged across the two pairs of marketing years, the correlation is only about 0.20. Again, there does not appear to be evidence of persistence in the pricing performance of market advisory services.

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 the next marketing year is evaluated. Market advisory programs are grouped into quantiles of thirds and fourths.

Quantile results for corn market advisory programs in the 1996 marketing year based on performance in 1995 are presented in Table 8. When the programs are broken into three groups, the group in the middle third of advisory performance in 1995 performs the best in 1996 in terms of average price and average percentage return above the market benchmark. The top third of advisory programs in 1995 has a slightly better average rank in 1996. Similarly mixed results are found among the top and middle groups when the programs are broken into four groups. While statistical significance is not assessed in this analysis, it appears that any real persistence in performance is found in the bottom group – i.e., market advisory programs that performed poorly in 1995 also perform poorly in 1996, both in terms of prices and rank.

The results of the 1996 and 1997 comparison for corn are presented in Table 9, and these results show a much more mixed picture. When broken into three groups, advisory performance measures among the groups are virtually identical in 1997. The quartile analysis contains a rather odd statistical anomaly, in which the first and third groups and the second and fourth groups in 1996 produce identical average prices in 1997, as well as similar ranks. This does not argue for overall persistence in performance among the groups.

The soybean performance results for 1995 versus 1996, shown in Table 10, present a very similar picture to the 1995 versus 1996 corn results. The main evidence of persistence in results is that services that do poorly in 1995 also show worse pricing performance in 1996. The soybean results for 1996 versus 1997 presented in Table 11 also are similar to those for corn over the same years, in that little evidence of persistence is found.

Table 12 presents two-year average results of the persistence measure shown in Tables 8 through 11. The advisory programs are grouped into quantiles each year (year t) and the average result in the next year (year t+1) is calculated. The two-year average results indicate that any persistence in year-to-year performance is found only among the more poorly performing advisory programs. Based upon the results in Tables 8 through 11, it is obvious that the two-year results are mostly a function of the 1995 versus 1996 results.[15]

In general, the predictability results reported in this section provide little evidence that advisory service pricing performance can be predicted from year-to-year. The limited evidence in favor of predictability applies only to the poorest performing services. This information may well be of use to farmers as they make selection decisions. Finally, the similarity between the results for advisory services and mutual funds is striking. A number of studies find that mutual fund investment performance is not predictable in general, but that mutual funds ranked in the bottom tier in one year tend to remain in the bottom tier in the future (e.g. Brown, Goetzmann, Ibbotson and Ross, 1992; Carhart, 1997). This has led researchers to search for an explanation of why investors continue to invest in mutual funds with predictably poor performance. One explanation is myopic loss aversion on the part of mutual fund investors. (Odean, 1998). Whether this line of reasoning is applicable to market advisory services must await further analysis on a larger sample.

Summary

Farmers view market advisory services as a significant source of market information and advice in their quest to manage price risks associated with grain marketing. Given the high value that farmers place upon market advisory services, it is somewhat surprising that only two academic studies investigate the pricing performance of advisory services. The lack of studies is most likely due to the difficulty in obtaining data on the stream of recommendations provided by services.

In 1994, the Agricultural Market Advisory Service (AgMAS) Project was initiated, with the goal of providing unbiased and rigorous evaluation of market advisory services for crop farmers. Since its inception, the AgMAS Project has been collecting marketing recommendations for about 25 market advisory programs. The AgMAS Project subscribes to all of the services that are followed, and as a result, "real-time" recommendations are obtained. This prevents the data from being subject to survivorship and hindsight biases.

The purpose of this paper is to address two basic performance questions for corn and soybeans using the net price received reported by the AgMAS Project for the 1995, 1996 and 1997 marketing years. The two basic questions are: 1) Do market advisory services, on average, outperform an appropriate market benchmark? and 2) Do market advisory services exhibit persistence in their performance from year-to-year? At least 21 advisory services are included in the evaluations for each commodity and marketing 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. The tests used to determine average performance of market

advisory services and predictability of performance through time have been widely applied in the financial literature.

Tests of pricing performance relative to a market benchmark are based on the proportion of services exceeding the benchmark price and the average percentage difference between the net price of services and the benchmark price. In statistical terms, the pricing performance test results provide only limited evidence of the ability of market advisory services to consistently and significantly "beat the market" in corn. There is substantial evidence that market advisory services consistently and significantly "beat the market" in soybeans. When corn and soybeans are combined and gross returns per acre analyzed, it is also found that market advisory services significantly outperform the market.

It is debatable whether the performance of advisory services also is economically significant. Perhaps the best perspective on this question is gained by examining returns for gross corn and soybean revenue per acre. For all three marketing years, gross returns averaged 1.84 percent above benchmark revenue. This translates into about $6 per acre. While this level of return is probably best characterized as modest, it also appears to be non-trivial, particularly in comparison to the cost of the services. However, there are several reasons to be cautious about concluding that advisory returns generate even a "modest" level of economic significance: i) the results are based on a small sample of years, ii) the trend in returns is downward over the sample period and iii) returns are concentrated in only one market, soybeans.

Tests of predictability are based on the year-to-year correlation of advisory service ranks, prices and percentage differences from the benchmark. In general, the predictability results provide little evidence that advisory service pricing performance can be predicted from year-to-year. The average correlation coefficient relating performance from one year to the next is about 0.10 to 0.20. When services are grouped by performance quantile, some evidence of predictability is found for the poorest performing services, but not for top performing services.

In conclusion, the results of this study suggest that, on average, market advisory services "beat the market" for the 1995 through 1997 corn and soybean crops. Possible explanations for this result include: i) a unique time period in corn and soybean markets, ii) inefficient commodity markets, iii) the skillfulness of advisory services or iv) a return to risk. Determining which explanation is correct will be an important subject for future research as more data on market advisory performance becomes available.

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Endnotes

[1] King, Lev and Nefstad (1995) examine the corn and soybean recommendations of two market advisory services for a single year. The focus of their study is not pricing performance, but a demonstration of the market accounting program *Market Tools*. Several analyses have appeared in the popular farm press. Marten (1984) examines the performance of six advisory services for corn and soybeans over 1981 through 1983. Otte (1986) investigates the performance of three services for corn over the period 1980 through 1984. Each of these studies indicates the average price generated by the services exceeds a benchmark price (e.g. selling 100 percent at harvest). More recent evaluations appear in *Top Producer* magazine (e.g. Powers, 1993). In this case, evaluations of corn, wheat, and soybean recommendations from advisory services are reported on a regular basis.

[2] See Zulauf and Irwin (1998) for a classification and review of marketing strategy studies.

[3] This assumption subsequently was 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. Two examples are Utterback Marketing Service, which is carried on a World Wide Web site, and Ag Review, which is available via e-mail. Both are for-pay subscription services.

[4] Four services from the original sample (Grain Field Report, Harris Weather/Elliott Advisory, North American Ag, and Prosperous Farmer) are dropped in 1997 because they no longer provide specific recommendations regarding cash sales. Another service (Agri-Edge) included in the original sample also is dropped in 1997 because the service was discontinued during the 1997 crop year. After becoming aware of its availability, one service (Progressive Ag) is added to the sample for 1996 and 1997. Another service (Utterback Marketing Services) is included in 1997, but not 1995 or 1996 because its marketing programs were not deemed to be clear enough to be followed by the AgMAS Project during these years. Two programs for corn only (Allendale futures & options and Ag Line by Doane hedge) were introduced for the 1996 marketing year, and therefore, are added for 1996 and 1997. Finally, one service (Ag Alert for Ontario) is added in 1996 but dropped in 1997 because their advice is geared to Canadian farmers, and after review, was not deemed to be generalizable to U.S. farmers.

[5] Four services (Agri-Edge, Brock Associates, Pro Farmer, and Stewart-Peterson Advisory Services) each have two distinct marketing programs, and one (Agri-Visor) has four distinct marketing programs. Two services (Allendale and Ag Line by Doane) both provide two distinct programs for corn but only one for soybeans.

[6] 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.

[7] 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.

[8] These results originally were presented in Jackson, Irwin and Good (1999). 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.

[9] 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.

[10] Note that gross returns in this case refers to returns net of marketing costs but no other production costs.

[11] These results are not presented in due to space constraints, but are available from the authors upon request.

[12] This calculation 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.

[13] Adding the subscription cost of services to the transactions costs considered in computing net advisory prices does not alter the performance results. For a 1,000 acre farm, subscription costs amount to less than one-tenth of one percent of the average corn and soybean gross return per acre.

[14] 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.

[15] Even if year-to-year persistence in performance is found, it may not be of much practical use to a farmer who wishes to use the information to either subscribe to a service based upon strong past performance or to avoid a service based upon poor past performance. This is due to the fact that each marketing window is two calendar years long, and each set of contiguous marketing windows overlaps by one year. For example, the 1995 marketing window ends on August 31, 1996. Therefore, final results for 1995-crop recommendations cannot be finalized until after this time. However, by the end of August 1996 the 1996 marketing window had already ended its first year. Therefore, a farmer who wished to employ the 1995 performance results to help select a market advisory service for the 1996 crop would find that the information was available too late. The 1995 results would, however, be available early in the 1997 marketing window. In order to address this issue, 1995 pricing performance of the advisory programs is compared with 1997 pricing performance. For corn, a significantly negative correlation is found for all three measures of pricing performance. For soybeans, correlation is found to be very near zero for all three measures. Given the results presented in the text, it is difficult to regard the 1995/1997 results for corn as little more than a statistical fluke.