Actual Farmer Market Timing

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One maxim that has been circulating among farmers is that most farmers sell in the lower third of the market. This maxim is soundly rejected using data from Oklahoma elevators. In fact, roughly half of producers sell in the upper third of the market. Thus, there does not seem to be a great need for producers to hire a market advisor to do their marketing for them. But, some farmers do store longer than is optimal and they could be encouraged to sell sooner after harvest. In the short run, farmers sold after price increases and held after price decreases. Price movements in the days after a large number of sales were no different than price movements after few sales. While farmers are noise traders in the short run, it does appear that they are responding to long-run market signals. Even though there may be room for improvement, it appears that farmers are doing a good job of deciding when to sell their wheat.

Key words: *behavioral finance, feedback traders, marketing strategies, feedback traders, wheat*

Considerable progress has been made in making marketing strategy recommendations to farmers. The dominant paradigm is the efficient market hypothesis that suggests that little profits can be made by trying to time when to sell wheat. The paradigm says that farmers will receive an average price on average.

A view that is now showing up at extension meetings is that farmers do worse than average. At a recent Farm Bureau meeting, for example, the master of ceremonies made the statement, "producers tend to sell on the bottom third of the market." In a mid-March 2001 issue of the *Progressive Farmer*, Dr. G. A. Barnaby from Kansas State University was quoted as saying, "Maybe that's why most farmers sell in the bottom third of the market" (Batchelor p. 25). The research question then is do farmers really sell in the bottom third of the market or is this just a clever marketing gimmick by market advisory services?

The idea of farmers selling in the bottom third of the market is not without theoretical foundation. New results from behavioral finance find that people have systematic psychological biases (Brorsen and Anderson). These biases could result in herding behavior in such a way that the majority could always be wrong. A study by Slusher is the only one that we know of that has ever addressed the issue of actual farmer performance and it is based on a narrow survey of Indiana corn farmers done 15 years ago. There is an immediate need for rigorous research to either challenge or support the claim that farmers sell in the bottom third of the market.

The general objective of this project will be to determine the actual pricing performance of Oklahoma wheat producers. The two specific objectives: (a) determine if most Oklahoma wheat producers sell in the bottom 1/3 of the market, and (b) determine if there is any pattern in when Oklahoma wheat producers tend to sell.

Granger causality tests are used to determine the pattern in when producers sell. Such tests are tests of whether producers are noise traders (Black; Sanders, Irwin, and Leuthold). Noise traders trade on noise as if it were information. Positive feedback noise traders buy after price increases while negative feedback traders sell. Sanders, Irwin, and Leuthold defined a

feedback trader as having long memory if more than the most recent period's return influenced decisions.

Data

Daily wheat purchases and actual sales prices were obtained from three Oklahoma elevators. Data were entered and carefully screened for errors. Oklahoma's wheat producing area is in the western part of the state. The three elevators were selected to be in the north, central, and southern parts of the wheat-producing region. The daily reported prices in each location were collected from the Oklahoma Crop Reporting Service for use on days when there were no sales.

Data were collected over June 1992 through May 2001. The southern, central and northern elevators handled 1.2, 1.25, and 2.3 million bushels with transactions of 1,572, 789, and 837 per year.

Oklahoma is closer to the Gulf than other wheat-producing regions and thus prices in Oklahoma tend to be higher than in northern states. Benirschka and Binkley argued that grain closest to the market would be stored the shortest period. Thus, we would expect most of Oklahoma's wheat to be sold early in the crop year. Indeed, the Oklahoma State University extension recommendation is to sell all wheat by November of each year. Oklahoma's harvest is in June but seasonal price lows are in July. Thus, Oklahoma producers particularly in the south have a strong incentive to sell at harvest. Therefore, Oklahoma data should provide a strong test of whether farmers sell in the lower third of the market.

What it means to sell in the lower third of the market had to be defined. We assume a 12-month cash-marketing window. Past research has shown that producers make little use of futures markets. Forward contracts in these markets were only 1-3% of sales and about 1% was carried across crop years, so the 12-month cash-marketing-only window seems realistic for Oklahoma wheat producers. Jirik et al. use a 24-month window in their analyses of market advisory services and 50% of sales are before harvest. While pre-harvest sales may be common for corn and soybeans in Illinois, they are not the norm for Oklahoma wheat.

Procedures

The prices available in the market were calculated by the actual price minus storage costs of $0.00085/day and interest costs of the prime rate plus two percent. Most grain was stored at the elevator, but some was stored on farm. Actual storage charges were provided in some cases and the storage costs used are quite close. The actual sales price and the daily reported price differed by less than a cent per bushel. Net prices were calculated for each transaction and for each day of the marketing year. The percent of bushels sold in the bottom third, bottom half, and upper third of the net prices offered that year was calculated.

For farmers to consistently do poorly, there must be some pattern in when they sell. Behavioral finance theory (Brorsen and Anderson) suggests some of the patterns that might exist.

The most important pattern to test is whether farmers are more likely to sell before price goes up than before it goes down. The approach will also be used to determine if sales vary by day of the week or time of the month. The framework to do such tests is Granger causality (Sanders, Irwin and Leuthold). Granger causality is used because spurious results can be obtained by regressing one autocorrelated series upon another.

The two variables in the bivariate autoregression are the frequency of sales on day t (day_t) and the change in reported prices on day t ($dprice_t$). Daily bushels sold was also considered as an alternative dependent variable to frequency of sales, but was not used because of severe nonnormality created due to some very large sales. Results using bushels also showed prices leading sales when a square-root transformation was used for the dependent variable, even though the regression had a severe loss of power due to the nonnormality. Only the prices for the northern elevator were used in the bivariate regression to avoid any possible influence of sales being clustered at harvest for the other locations.

Seasonality was modeled with sine and cosine functions of frequency one year, six months, and four months. Day of the week was modeled with dummy variables. Friday was omitted so the coefficients should be interpreted as the difference from Friday.

The frequency of sales is a count variable. The two traditional ways of modeling a count variable are (1) ordinary least squares with a square-root transformation of the dependent variable and (2) a Poisson regression model. The square-root model failed to provide residuals that were normally distributed so the Poisson model was used instead. Both approaches gave similar answers regarding prices leading sales, but the Poisson did show considerably more statistical significance. An asymmetric response was also considered. Producers were slightly more responsive to price increases than price decreases. No new insight was gained from the more complex model so the simpler model is reported here.

The model for change in price is estimated with ordinary least squares. No unit-root tests were conducted since the variable of interest is the change in price. Literature has shown that high-frequency cash prices can be well modeled as unit-root processes even though low-frequency cash prices are clearly mean reverting.

The lengths of lag were selected using sequential F-tests with a maximum lag length of eight. The length of lag was allowed to differ across the two models, but not within a model. Two lags were selected for change in price and eight lags were selected for frequency of sales. Numerous diagnostic checks were conducted. Neither current model passes all tests. There is some remaining autocorrelation in both models and thus the reported results do suffer from some asymptotic bias

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Results

Table 1 shows the proportions of sales occurring each month. The southern elevator has 56% of sales at harvest during June. The southern area is one of the first to harvest wheat and so producers sell immediately before prices reach harvest lows. Producers at the northern area sell only 9% of their wheat in June. These producers apparently receive a return to storage with

October being the month with the most wheat marketed. The 29% of sales in March-May for the northern area is higher than expected. There may be some producers waiting for high prices that never come and then selling at the end of the marketing window. The behavior is consistent with myopic loss aversion. This could be due to what Kahneman and Riepe (p. 60) call the disposition effect, which is the reluctance of investors to realize their losses. There is a difference between markets being efficient and producers making efficient decisions. Future research should investigate whether some Oklahoma producers need to be encouraged to sell earlier in the crop year. Anderson recommends that Oklahoma producers sell before the end of the calendar year unless they want to hold for tax reasons. Some Oklahoma producers appear to be making inefficient decisions. Certainly it does appear that most producers are responding to market signals to sell their wheat early in the marketing year.

Table 2 presents the test of the primary hypothesis of this study: do farmers sell in the lower one-third of the market. The hypothesis is soundly rejected. Not only do most not sell in the lower third, nearly half sell in the upper third. This is true even at the northern elevator where harvest sales are light. Again the results show that farmers are responding to market signals of when to time their sales. The argument that most farmers sell in the bottom 1/3 of the market has been used to argue that farmers should use market advisory services or marketing pools that seek to obtain an average price. Since that is not the case, there does not seem to be any strong need for most producers to change the way that they time their sales. The results do not necessarily mean that producers have an ability to predict price. It may simply mean that producers are receiving a return from responding to market signals of whether to store or sell.

The returns that producers received above a simple twelve-month average are presented in Table 3. The returns are substantially larger at the southern elevator. But, even at the northern elevator, producers beat the twelve-month average by 9 cents/bushel. Elevators in some parts of the country have begun to offer contracts that achieve the 12-month average by selling some wheat each day. The producers clearly beat such a strategy. Of course, the results do not rule out using a six-month average. Anderson recommends that Oklahoma wheat producers sell 1/3 in June, 1/3 in September, and 1/3 in November and thus a six-month window would be more consistent with his recommendation. Anderson may need to modify his recommendation to increase the proportion sold in June for southern Oklahoma producers.

The Poisson regression shows the strong positive influence of price on the frequency of sales (Table 4). Thus, the producers are negative feedback traders. Negative feedback traders provide liquidity so it is possibly a profitable strategy if price changes are negatively autocorrelated. These findings are opposite of the positive feedback found with market sentiment indexes that are designed for small speculators (Sanders, Irwin, and Leuthold; De Bondt; Solt and Statman). The feedback is a long-memory process since more than the first is statistically significant. Seasonality and day of the week are also significant with the most sales occurring on Monday and the least on Thursday.

Lagged sales are not statistically significant in predicting price changes. Therefore, producers are noise traders in the short run. The negative coefficients on both lags of price changes do suggest some potential return to providing liquidity through negative feedback trading. The negative coefficient on the second lag of sales is significant at the 10% level which

is mildly suggestive that producers may be selling at good times. Seasonality and day of the week are not statistically significant. The results in table 5 again support the idea that farmers are good marketers since they are definitely not selling right before the price goes up.

Conclusions

The hypothesis, "wheat producers sell in the bottom 1/3 of the market," was not supported by this research. Thus farmers do not need to use market advisory services or marketing pools that seek to obtain an average price since they are getting a better than average price. Oklahoma has a strong price incentive to sell early in the crop year. Regions far from consuming areas and with later harvest dates can be expected to greater returns to storage than Oklahoma producers. Thus, while a twelve-month pool would work poorly in Oklahoma, it might be fine in other states.

In the short run farmers are negative feedback traders since they sell after price increases and tend to hold after price decreases. They are also noise traders since their sales did not predict price changes. Thus producers have been successful in deciding whether to sell in June or in March, but they have had little or no success in deciding whether to sell today or tomorrow. Thus, extension-marketing programs that have ignored day-to-day movements and concentrated on how to respond to market signals of when to time sales still seems the best way to go. There is some indication of producers storing grain longer than is economical, so there is benefit from an extension program that encourages farmers to sell. Inaction can result from the psychological mistake of being reluctant to realize losses. The results also imply that producers are doing a good job of marketing and they do not need to invest more in marketing. Producers should spend scarce management resources concentrating on being a low-cost producer or on marketing activities that add value rather than trying to predict what the price is going to be tomorrow or next week.

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