The Impact of Marketing Strategy Information on the Producer's Selling Decision

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There is no shortage of studies regarding price forecasting and marketing strategies of producers. However, the majority of these studies take a normative approach, focusing on deriving an optimal strategy for producers to follow based on information received from producer surveys. Due to such things as psychological biases, producers may not actually use the marketing information that they say they do. This study uses actual producer transaction data to determine how producers marketing decisions correspond with those recommended by market advisory services and with those that use futures spreads to calculate expected returns. The results show that producers do respond to using futures spreads to represent expected returns to storage. Also, it appears that Oklahoma producers make marketing decisions opposite of those recommended by market advisory services.

Key words: marketing strategies, trend followers, price expectations, wheat

Introduction

Agricultural economists have supplied the agricultural industry with many studies regarding the price forecasting and marketing strategies of producers. Nearly all of these studies take a normative approach to the topic and attempt to derive an "optimal" marketing strategy for producers to follow. However, recent studies indicate that producers seldom follow the price forecasting and marketing strategy recommendations suggested by agricultural economists (Brorsen and Irwin; Musser, Patrick, and Eckman; McNew and Musser). Producers tend to avoid the complex pricing models that researchers provide and prefer more simplistic forecasting methods (Anderson and Mapp). This lack of use by producers suggests that the price forecasting and marketing strategy information being supplied to producers is not reflective of their actual marketing decisions.

In order to provide producers with more relevant marketing information, we must ask what sources of marketing strategy information actually influence the producers' marketing decisions? The majority of research on the market information used by producers focuses on results from producer surveys (Patrick and Ullerich; Batte, Schnitkey, and Jones; Ortmann et al.). These surveys indicate that producers consider private consultants, such as market advisory services[†], a highly important source of marketing information. For example, Patrick and Ullerich's study of 17 marketing information sources reported that market advisory services were outranked only by past farm records. In a study by Schroeder et al. a sample of Kansas farmers rank market advisory services as the number one source of information for developing price expectations.

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[†] For a subscription fee advisory services help farmers with their marketing decisions by providing marketing information, analysis and recommendations. See Isengildina et al. for a complete review of the market advisory service industry.

While these surveys reveal the information sources producers say they use, there is limited empirical research on whether producers actually follow market advisory service recommendations in their marketing decisions. Survey responses by Pennings, Irwin, and Good and Isengildina et al. suggest few producers closely follow the specific pricing recommendations of market advisory services. Instead, producers generally use market advisory services for background information, comparing it with other information sources in order to make a decision (Pennings, Irwin, and Good; Isengildina et al.). One reason that producers do not closely follow these recommendations may be the low pricing performance shown by market advisory services. The average revenue achieved by following market advisory service recommendations for corn and soybeans is only slightly above the benchmark average (Irwin, Martines-Filho, and Good), while the average revenue achieved for wheat is well below the benchmark average (Martines-Filho, Good, and Irwin).

Other price forecasting and marketing strategies research has found that using marketing strategies based on market-generated forecasts of productions profits are the best bet for producers. Zulauf and Irwin suggested using the local cash price basis (futures-cash) as a marketing signal and found that storing when the basis is larger than storage costs can be a favorable marketing strategy, given that a short futures hedge is placed at harvest. Additional research on the accuracy of price forecasting models reveals that forecasts based on econometric models generally do no better than forecasts based on futures markets (Tomek) and may even be outperformed by futures markets for certain commodities (Kastens and Schroeder).

Matwichuk found a positive relationship between the market sentiment of market advisory services and past commodity returns, suggesting that market advisory services are trend followers. Trend followers make marketing decisions based on technical rather than fundamental information (Sanders et al.). The question now is, "Do producers prefer marketing strategies based on mainly technical information, such as market advisory service recommendations, or do they prefer more fundamental strategies, such as changes in expected returns to storage?" Thus, the objective of this research is to determine how wheat producers' selling decisions correspond with market advisory service recommendations and changes in expected returns. In order to satisfy this objective, a Tobit regression model will be used to evaluate the effect of market advisory service recommendations and futures price spreads on the number of wheat sales that occur on a given day for a sample of Oklahoma wheat producers.

The majority of past research on producer marketing information consists of producer surveys that report which information sources producers say they use. However, it is possible that producers do not act in the way that they say they act. Studies on behavioral finance find that people are prone to psychological biases when making marketing decisions (Brorsen and Anderson, 2001; Kahneman and Riepe). Examples of psychological biases include overconfidence in one's ability to predict the market and the tendency to remember successes and forget failures, known as hindsight bias. Individuals typically are not aware that they have these biases. Thus, research based on producer surveys may not accurately reflect the marketing strategy needs of producers. This study goes beyond producer surveys by using actual producer transactions to obtain a more precise idea of the type of information producers are using to make their marketing decisions.

Theory

There is no shortage of literature regarding the price of storage and the optimal marketing strategy that crop producers should follow (e.g. Working; Williams and Wright; Fackler and Livingston; Zulauf and Irwin). The theory of the price of storage explains inter-temporal price relationships between spot and futures with regards to the cost of carrying a particular commodity. It takes into account the interest foregone in storing a commodity (opportunity cost of storage), the physical cost of storage (including a risk premium), and the convenience yield for holding stocks (Working; Fama and French; Yoon and Brorsen). Thus, the price of storage, or the basis, is defined as:

(1) $$F_{t,T} - S_t = S_t R_{t,T} + W_{t,T} - C_{t,T}$$

where $F_{t,T}$ is the futures price at time t for delivery of a commodity at time T, S_t is the spot price at time t, $R_{t,T}$ is the interest foregone during storage (opportunity cost), $W_{t,T}$ is the marginal physical cost of storage (e.g. storage rent, handling costs, insurance, transport, etc.), and $C_{t,T}$ is the marginal convenience yield. The price of storage, $F_{t,T} - S_t$, can also be interpreted as the return from purchasing the commodity at t and selling it for delivery at T; this is the return to storage from time period t to T ($t < T$).

The convenience yield, as defined by Working, refers to the implicit benefits that accrue to the owner of a physical stock but not to the owner of a contract for future delivery. For example, a convenience yield may exist from holding stores of some commodities, such as wheat, because they are inputs in the production of other commodities, such as flour. Stockholders may also earn a convenience yield by being able to respond efficiently to unexpected changes in supply and demand. The theory of storage predicts an inverse relationship between convenience yields and inventories (Fama and French); therefore, the benefits are greater when inventories are small.

The basic farmer marketing strategy is to continue to store as long as the expected marginal returns from storage are greater than the expected marginal costs of storage, defined as:

(2) $$E_t(F_{t,T} - S_t) > E_t(S_t R_{t,T} + W_{t,T})$$

where the expected marginal returns to storage in time t are represented by the basis, $F_{t,T} - S_t$, and the expected marginal cost of storage at time t are the sum of interest foregone (opportunity costs) and the physical costs of storage (rent, handling charges, insurance, transport). Returns to storage are not the only factor in the producer's marketing strategy. Government programs and producers' individual cash flows and taxes could also play a role. For example, if a producer's storage cost is low government loan programs may encourage continued storage by allowing the producer to retain the real option value implicit in a loan program (Yoon and Brorsen). Producers may time their selling decisions with their need for cash inflows to make loan payments or cover production expenses. They might also hold off selling until after the first of the year in order to reduce their income tax.

Fackler and Livingston argue that this basic strategy is too simplistic for crop producers because it assumes that stocks can easily be replenished during the marketing year. Due to the fact that a sale out of storage is an irreversible action for a crop producer, they propose a marketing strategy that still involves storing at low prices and selling at high prices but with a cutoff price function marking the boundary between low and high prices. Thus, producers would sell if the current expected returns to storage exceed the maximum expected future returns to storage,

$$(3) \qquad E_t[(F_{t,} - S_t) - S_t R_t + W_t] > \max E_t[(F_{t+1,T} - S_{t+1,T}) - S_{t+1,T} R_{t+1,T} + W_{t+1,T}]$$

where $E_t[(F_t - S_t) - S_t R_t + W_t]$ is the expected net returns from selling at the present time *t* and $\max E_t[(F_{t+1,T} - S_{t+1,T}) - S_{t+1,T} R_{t+1,T} + W_{t+1,T}]$ are the maximum future returns to storage expected at any future date. Zulauf and Irwin propose a marketing strategy that more resembles the basic strategy. They found that the most successful strategies were those that used the futures market as a source of information. The marketing strategy they suggest is to base storage decisions on whether the current futures-cash basis (return to storage) exceeds the cost of storing and use hedging to increase the chances of acquiring the expected return. In the current study few producers likely use hedging in their marketing decisions. Considering that hedging only increased the statistical power of Zulauf and Irwin's tests, rather than increased the expected returns, their arguments still apply even though producers were not using futures.

An important element of equations (2) and (3) is that producers must form expectations about the returns to storage. Agricultural economists typically assume that producers form rational expectations. This assumption implies that producers use all available market information to make rational decisions. Producers may use fundamental information, such as changes in futures prices, or technical information, such as price trends, to make their marketing decisions. Research indicates that technical analysis, in the form of trend following, can be profitable, though usually in relatively small amounts (Covel; Lukac and Brorsen). Market advisory services and sentiment indices have been found to follow price trends in the manner of positive feedback traders, meaning that they recommend holding when prices increase (Matwichuk, Sanders et al.). Producers, on the other hand, are typically thought to be negative feedback traders, selling after prices increase (Brorsen and Anderson, 2002; Sanders et al.). Aside from fundamental and technical strategies, producers could base their marketing decisions on non-information, known as noise trading (Black), or they could use mechanical marketing strategies that involve selling at the same time every year regardless of the market (i.e. selling at harvest). The point is that in order to better understand producers' marketing strategies we must first understand how producers form price expectations.

Data

Data are from three grain elevators located in the northern, southern, and central areas of western Oklahoma. The data span nine crop years, from the harvest of 1992 through the harvest of 2000, and contain individual producer transactions of wheat sales at each elevator. Information about each sale includes the number of bushels sold, price per bushel, and date of transaction. Sales decrease as the number of weeks after harvest increase. We attempt to measure this deviation around annual seasonal patterns of sales by including the number of weeks after harvest that the sale occurred. Harvest is a four-week period that differs for each elevator depending on location. Beginning harvest dates for the southern, central, and northern elevators are May 25, June 1, and June 12 respectively.

Table 1 contains the descriptive statistics for each elevator. The southern elevator has the highest price, lowest average number of weeks, and the highest percentage of harvest sales. According to Benirschka and Binkley, locations closer to the market (the Gulf) typically have higher negative returns to storage than locations further away from the market. Therefore, southern producers are more likely to sell at or close to harvest which results in a lower average number of weeks after harvest compared to the central and northern elevators. The higher average price at the southern elevator is likely due to the fact that the southern elevator is closer to the market (the Gulf), and thus transportation costs are lower. Therefore, the average price is higher at the southern elevator. Another reason for the higher average price could be that harvest is slightly earlier at the southern elevator providing the potential to sell wheat before prices reach harvest lows.

In addition to the elevator data, wheat market advisory service recommendations were obtained from the Agricultural Market Advisory Service (AgMAS) Project at the University of Illinois. The data contain daily selling recommendations from 34 market advisory services. Each recommendation consists of the percentage of stored crop to be sold on a given day in a given year, spanning the crop years of 1995-1999. Market advisory services offer "blanket" recommendations to farmers, meaning that the selling recommendation for a given day is typically not reflective of individual producer location. Producers in Oklahoma receive the same recommendation as producers in Illinois. For the purpose of this study we will use the average daily sales recommendations for the 34 advisory services. Since the market advisory service sales recommendations are represented as a cumulative percentage, the difference between the previous day and the following day was calculated, giving us daily recommended sales. This is the value that is used to represent market advisory service recommendations in the estimation process. Due to elevator data constraints, the study does not consider pre-harvest sales recommendations which may account for as much as 50% of the market advisory service recommendations.

Futures spreads are used to represent the expected returns to storage and are calculated based on Kansas City futures prices. Wheat futures contracts are sold in March, May, July, September, and December. Oklahoma producers do not typically store their wheat for long periods of time, therefore, only the nearby and distant futures price spreads are used. The nearby spread is the futures spread that is nearest to the date of the given transactions, and the distant spread is the futures spread that is second nearest to the given transaction date. For example, the nearby spread for a transaction with a date of May 5 for a given year would be the difference between the September 5th futures price and the July 5th futures price for the given year. The distant spread for the same transaction would be the difference between the December 5th futures price and the September 5th futures price for the given year. Due to the fact that futures contracts are bought and sold only during certain months, a cutoff date to distinguish between the selling and delivery timeframe for those months had to be established. The cutoff date was set at the 20th of the month prior to each contract month (March, May, July, September, and December). Since all the spreads do not cover the same number of months, they were divided by the number of days in each price spread. For example, the May-July spread contains two months and the December-March spread consists of three months, so the price spreads were divided by the number of days in each spread, 61 and 90, respectively (ignoring leap years).

Before using the data certain modifications had to be performed. First, the 1998 crop year is not included in the data at the northern elevator due to missing producer transaction information. Secondly, the last two weeks in May for every year were deleted from the dataset for the southern elevator and the first two weeks in June for every year were deleted from the dataset for the northern elevator. This is due to the fact that the market advisory service data always assumed that the crop year began on June 1 and ended on May 31 of the following year. While the harvest date at the central elevator coincides with this assumption, the southern elevator's harvest is earlier in the season and the northern elevator's harvest is later in the season. Therefore, in order for the market advisory service recommendations to correctly correspond with the elevator transactions the aforementioned dates were deleted for the southern and northern elevators.

Procedure

The following regression model is estimated for each elevator to determine how producers' selling decisions correspond with market advisory service recommendations and expected returns to storage:

$$(4) \qquad ws_{ikt} = \beta_0 + \sum_{y=1}^{8} \beta_{1y} cy_{yt} + \beta_2 near_{ikt} + \beta_3 dist_{ikt} + \beta_4 mas_{i,k-1,t} + \beta_5 wah_{ikt} + \beta_6 wah_{ikt}^2 + \varepsilon_{ikt}$$

where ws_{ikt} is the number of wheat sales that occurred at the i^{th} elevator on the k^{th} day in year t, cy_t is a yearly dummy variable to adjust for differences in price across years, $near_{ikt}$ is the nearby futures spread, $dist_{ikt}$ is the distant futures spread, $mas_{i,k-1,t}$ is the lagged average percent of the crop that market advisory services recommended selling on that date[‡], wah_{ikt} is the number of weeks after harvest that the transaction occurred, wah_{ikt}^2 is the non-linear term for number of weeks after harvest, and ε_{ikt} is the error term such that $\varepsilon_{it} \sim N(0, \sigma_{it}^2)$. The error term is expected to be heteroskedastic with the following variance equation:

$$(5) \qquad \sigma_{ikt}^2 = \exp(\alpha_0 + \alpha_1 wah_{ikt} + \alpha_2 wah_{ikt}^2).$$

Due to the fact that the dependent variable can take on a value of zero when no transactions occur, a Tobit regression will be used to estimate the truncated model. Therefore, it allows the dependent variable to reflect when no sales take place. The Tobit regression procedure assumes normality which is not the case in our model. A square root transformation on the dependent variable was done to induce normality. The square root transformation is the standard transformation used with count data. The model will be tested for heteroskedasticity and estimated using maximum likelihood.

[‡] A non-lagged market advisory service variable was considered, but was not found to be significant. Examination of the cross-correlation between the residuals of the dependent variable and the market advisory service variable led to the conclusion that the variable should be lagged by one day. This seems reasonable since it could take a day for farmers to receive the information.

Typically, producers will continue to store as long as expected returns to storage are greater than expected costs of storage. As the returns to storage increase, producers are expected to continue storing and fewer wheat sales will take place. Thus, β_2 and β_3 are expected to be negative. Since producer surveys indicate that a large number of producers report using market advisory service recommendations, the number of wheat sales is expected to increase with the market advisory services' daily selling recommendations, so β_4 is expected to be positive. As mentioned before, Oklahoma wheat producers typically sell the majority of their crop at or close to harvest. Therefore, as weeks after harvest increase we expect to observe fewer transactions and coefficients β_5 and β_6 are expected to be negative and positive, respectively.

Results

Tables 2, 3, and 4 show the results of the Tobit regression of expected returns to storage (futures price spreads) and market advisory service recommendations on number of wheat sales at the northern, central and southern elevators. As expected the variables representing the nearby and distant futures price spreads exhibited a negative relationship with the number of wheat sales at all three locations. Thus, when spreads are high producers are less likely to sell and more inclined to continue to store their wheat. The nearby spreads were found to be significant at the 95% confidence level for all three elevators, while the distant futures spread was only significant at the northern and central elevators. Since the southern elevator is one of the first to harvest wheat, most southern producers sell immediately before prices reach harvest lows. Also, the returns to storage tend to increase as location moves further away from the market (Benirschka and Binkley). Therefore, more long-term storage is expected to occur at the central and northern elevators and could explain why the distant futures spread increases in significance as elevator location moves northward. These results indicate that producers are using futures price spreads as part of their selling decision. This is consistent with a marketing strategy that uses fundamental analysis, such as using futures spreads to calculate expected returns to storage, and suggests that producers may, at least partly, base price expectations and storage decisions on fundamental information.

The regression further indicated that the market advisory service recommendation variable did not have the expected positive sign across all elevators. The sign was only positive at the central elevator. However, it was not statistically significant, signifying that market advisory service recommendations have no affect on producers' selling decisions at the central elevator. Market advisory service recommendations exhibited an inverse relationship at the southern and northern elevators where it was significant at the 95% and 90% confidence intervals, respectively. These results suggest that producers are not following the recommendations of market advisory services. Instead, they are doing the opposite of what the advisory services recommend. Market advisory services have been found to be positive feedback traders, holding when prices rise and selling when prices fall (Matwichuk; Sanders et al.), while producers have been found to be negative feedback traders, holding when prices fall and selling when prices rise (Brorsen and Anderson, 2002). Thus, producers are likely unknowingly making marketing decisions in opposite directions of market advisory service recommendations. This negative relationship indicates that producers do not directly implement strategies based on technical information into their marketing decisions.

The variables measuring number of weeks after harvest are statistically significant at the 95% confidence level and exhibit the expected signs across all three elevators indicating that as the number of weeks after harvest increase fewer wheat sales take place. This is consistent with the theory that Oklahoma wheat producers typically sell the majority of their crop at or close to harvest (Cunningham, Brorsen, and Anderson).

Conclusion

This paper determined whether Oklahoma wheat producers' market timing decisions were correlated with fundamental (expected returns) or technical (market advisory service recommendations) information. The results indicate that producers are responding to fundamental information in the form of futures spreads that provide expected returns to storage. Producers' decisions were negatively related to market advisory service recommendations. Apparently, producers typically make selling decisions that are opposite of those of trend followers. Producers normally sell when prices rise, while trend followers hold when prices rise in the hope that they will rise even further. Since market advisory services have been found to be trend followers, their recommendations do not match the marketing decisions made by producers. Therefore, despite survey results showing that producers say they view market advisory service recommendations as very important to their marketing decisions, Oklahoma wheat producers do not closely follow the recommendations. It is more likely that producers only use market advisory service recommendations as background information, comparing it with other information sources in order to make marketing decisions.

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Table 1. Descriptive Statistics for Each Elevator

Descriptive Statistics	South	Central	North
Average price ($/bu.)	3.41	3.32	3.39
Average week after harvest	5	16	18
Percent harvest sales	58 %	19 %	14 %
Number of observations	14434	7089	6389

Table 2. Regression of Market Information on Wheat Sales for Northern Elevator

	Estimate	t-value	Pr > |t|
Intercept	.4646	3.59	.0003
1996 crop year	.7137	6.27	< .0001
1997 crop year	2.9020	20.02	< .0001
1999 crop year	2.7635	17.83	< .0001
Nearby Futures Spread (*near*)	- 2.4808**[a]	- 8.69	< .0001
Distant Futures Spread (*dist*)	- 2.8721**	- 9.25	< .0001
Market Advisory Service Recommendation (*mas*)	- .0579*	- 1.87	.0615
Weeks after harvest (*wah*)	- .0965**	- 7.66	< .0001
Weeks after harvest squared (wah^2*)*	.0015**	5.45	< .0001

[a] One asterisk indicates significance at the 90% level and two asterisks indicates significance at the 95% level.

Table 3. Regression of Market Information on Wheat Sales for Central Elevator

	Estimate	t-value	Pr > |t|
Intercept	1.8567	14.41	< .0001
1996 crop year	- .2420	- 2.29	.0218
1997 crop year	.4529	2.59	.0095
1998 crop year	.7074	3.86	.001
1999 crop year	.3062	1.61	.1080
Nearby Futures Spread (*near*)	- .8778**[a]	- 3.38	.0007
Distant Futures Spread (*dist*)	- .8909**	- 2.80	.0050
Market Advisory Service Recommendation (*mas*)	.0203	.87	.3838
Weeks after harvest (*wah*)	- .0624**	- 5.95	< .0001
*Weeks after harvest squared (*wah^2*)*	.0008**	3.54	.0004

[a] Two asterisks indicates significance at the 95% level.

Table 4. Regression of Market Information on Wheat Sales for Southern Elevator

	Estimate	t-value	Pr > |t|
Intercept	2.9586	9.76	< .0001
1996 crop year	.0399	.16	.8727
1997 crop year	1.4263	3.61	.0003
1998 crop year	.5075	1.20	.2299
1999 crop year	.5795	1.33	.1840
Nearby Futures Spread (*near*)	- 1.7803**[a]	- 2.99	.0028
Distant Futures Spread (*dist*)	- .3412	- .46	.6461
Market Advisory Service Recommendation (*mas*)	- .1372**	- 2.40	.0165
Weeks after harvest (*wah*)	- .2910**	- 11.71	< .0001
Weeks after harvest squared (wah^2)	.0046**	9.21	< .0001

[a] Two asterisks indicates significance at the 95% level.