Cash Marketing Styles and Performance Persistence of Wheat Producers

by

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Years of research have been dedicated to determining the best time for producers to sell their commodities. Researchers have developed basis models, market efficiency tests, hedging/risk models, price forecasting models, and many other models in an attempt to help producers. There is a vast amount of material on how economists believe that a rational producer should act and react in the market place. However, there is little research on how producers actually sell commodities. This paper first measures the extent to which producers display an active or mechanical marketing style using individual farmer sales. Next, tests of performance persistence are conducted to determine if there is any advantage to an active marketing style. The results show that southern Oklahoma wheat producers tend to have a mechanical marketing style, while at other locations producers appear to have a more active style. The results show no evidence of performance persistence and thus suggest that there is no advantage to using an active marketing style.

Keywords: performance persistence, marketing styles, wheat, cash markets, storage

Introduction

Past research has sought to help farmers with marketing commodities. This research includes optimal hedging strategies (Harwood et al.; McNew and Musser; Musser, Patrick, and Eckman; Simmons; and Zuniga, Coble, and Heifner), tests of market efficiency (Brorsen 2000; Kastens and Schroeder; McKenzie and Holt; Shiller; Simmons; Zulauf and Irwin), and price forecasting (Just and Rausser; Norwood and Schroeder; O'Brien, Hayenga, and Babcock; Robledo, Zapata, and McCracken; Tomek), yet there is little research studying actual farmer marketing. Past research has shown that few farmers are following hedging strategies; and if they do, they are not using "optimal" hedging strategies (Anderson and Mapp; Katchova and Miranda; McNew and Musser; Selley and Wilson; Simmons).

Most tests of efficiency found markets to be at least close to efficient, which suggests there may be little chance of increasing profit with a marketing strategy. Similarly, the price forecasting literature has rarely found one method to be significantly better than another. Yet, farmers still demand considerable market information from both private market advisory services and extension economists (Ortmann et al.). This dichotomy between research results and farmer actions suggests a need for further research.

Coble and Barnett call for further investigation of producer decision-making. It is apparent that there is a lack of real-world knowledge of what farmers are doing. Brorsen and Irwin argue there needs to be a move to the use of actual data and the study of what farmers are doing; because if producers are not using the research, then what good is it? There have been a few limited studies of individual farmer marketing decisions (McNew and Musser; and Slusher), but only Slusher used actual farmer transactions. McNew and Musser used data from a hedging game to evaluate producer marketing decisions; while Slusher collected four years of actual marketing data from 129 farmers to evaluate farmers.

There have been numerous surveys to find what marketing information farmers are using (Ford and Babb; Gloy, Akridge, and Whipker; Ortmann et al; Patrick and Ullerich). However, the surveys vary regarding which information sources were the most important to farmers. Mostly, the farms used information from paid sources and on-the-farm data. Paid sources that farmers use include computerized information, magazines, and consultants. Farmers highly value consultants, or market advisory services (Bertoli et al.). Bertoli et al. found that market advisory programs make mostly cash marketing recommendations rather than suggesting futures and options market strategies, which is confirmation that research on optimal hedging strategies and futures market efficiency has not been of much direct benefit to farmers. If farmers are using cash marketing strategies, then research should focus on cash marketing strategies.

Farmers have two basic choices in marketing styles. One is to follow an active marketing strategy where they acquire information and make decisions based on price expectations. The second is a purely mechanical strategy that is the same every year regardless of market information. An active style can be based on fundamental and/or technical analysis. Such information is likely filtered before being provided to farmers by extension economists or market advisory services. An active style is not necessarily inconsistent with efficient markets as Zulauf and Irwin argue that the basis exceeding storage costs can be a signal for producer to store even in an efficient market.

In contrast to an active marketing style is a mechanical style of doing the same thing every year. One of the simplest mechanical styles is always selling at harvest. Anderson advocates a mechanical style of selling equal portions of 1/3 in June, 1/3 in September, and 1/3 in November (Anderson and Brorsen). The benchmark used by Irwin, Martines-Filho, and Good is a mechanical style of selling the same amount every day. The argument for using a mechanical strategy is that since markets are efficient, there is no gain in trying to "fight the market." Mechanical styles are also supported by behavioral finance because people may make psychological mistakes and end up losing when they speculate on price movements (Brorsen). Therefore, through doing the same thing every year, producers can eliminate these psychological mistakes.

The paper first measures the extent to which the styles used by producers are either active or mechanical. The data allow measuring for each producer, the annual average week sold, number of weekly transactions, and total bushels sold. The activeness of the marketing style is measured by whether the producer follows the same strategy each year. Then price received is regressed against activeness to determine if producers using an active style receive a higher price than those using a mechanical style.

An alternative approach to determine if there is any possible advantage or disadvantage in trying to fight the market is to test for the existence of performance persistence among Oklahoma wheat producers. The null hypothesis tested is that the past ranking of a farmer's price received does not help predict the farmer's future ranking. If there are farmers that have consistent performance, then these farmers' actions can be used to identify styles with superior performance. Performance persistence has been measured in past literature, but primarily in finance markets (Agarwal and Naik; Blake and Timmermann; Brorsen and Townsend; Harri and Brorsen; Kazemi, Schneeweis, and Pancholi; Tonks). Research with mutual funds and commodity trading advisors has found small amounts of performance persistence, but these differences are likely because of differences in cost. Performance persistence may also exist for farmers for costs and production, but the focus here is on marketing performance persistence.

Data

Data are from three grain elevators located in the north, south, and center of western Oklahoma. The data are from the harvest of 1992 through the spring of 2001 (nine crop years). The data contain all individual transactions of wheat sales at each elevator. Each transaction has the seller, number of bushels, price per bushel, and date. However, each seller's name was not always spelled correctly and some sellers operated under a variety of names. To remedy this problem, elevator managers were asked to identify the primary marketing decision maker for each sale. This was done by giving the elevator managers a spreadsheet containing the seller names, and then they identified the primary decision maker for each seller.

Table 1 contains the descriptive statistics for each elevator. Average price is the actual average price that producers received over 9 years of data. The average net price is the adjusted average price that producers received over the 9 years of data. The price is adjusted for carrying costs, which includes interest and storage costs. Harvest price is the average price that producers received at harvest, which is a four-week period defined differently for each elevator. Beginning harvest dates for the southern, central, and northern elevators are May 25, June 1, and June 12 respectively. Percent of harvest sales is the percent of sales that occurred during the four-week harvest, compared to the whole year. Average week is the average week that producers chose to market their wheat for all years.

Table 1. Descriptive Statistics for Each Elevator

Descriptive Statistics	South	Central	North
Average price ($/bu.)	3.41	3.32	3.39
Average net price ($/bu.)	3.35	3.12	3.17
Harvest price ($/bu.)	3.47	3.20	3.39
Number of observations	14434	7089	6389
Percent harvest sales	58 %	19 %	14 %
Average week[a]	5	16	18

[a] Harvest is 4 weeks long and considered to be week 1.

A number of other data errors were also corrected, and some transactions were deleted from the data set. First, the northern elevator is missing transactions from 5/1/98 to 6/1/99. Second, if the price per bushel was less than $1.50, it was deleted. The reason for deletion was that the transaction was probably for wheat cleanings or a data entry error. If the price per bushel was greater than $10.05, it was deleted. The reason for deletion was that the transaction was probably a data entry error. The $10.05 amount is the high cut off, because it was the lowest extremity on the high side of price. The other prices that were high were similar or near other prices around the same date. Another deletion within the data set included, transactions that had negative bushels. These transactions were deleted because they identify purchases rather than sales. If an elevator manager suggested the transaction be deleted, then it was deleted as well as transactions with missing data (such as a missing name, bushels, or price). Data are still included when the elevator manager could not easily determine a decision maker for that seller name. It is assumed that the same seller was the decision maker all 8 years for transactions where a name was included but decision maker could not be determined. Table 2 shows all of the data errors were from the southern elevator.

Table 2. Observations Deleted or Missing by Elevator

Reason	Southern	Central	Northern
<$1.50	19	0	0
>$10.05	20	0	0
Negative Bushels	34	0	0
Missing Data	297	18	55
Other	1	0	0

Many of the transactions for decision makers happen on the same day or on days close to each other. Since the number of transactions is a variable being examined, the transactions have been lumped into weeks. Thus, if there were 24 transactions within a specified seven-day period[1], they would count as one transaction. Therefore if a seller has two transactions, this means the seller traded in two different weeks.

Storage costs and interest costs are calculated the same for all elevators. The storage cost, set by the elevators, averages $.00085/day, which is $.0255/month. The interest cost is calculated at the prime rate for that year plus 2%. The prime rate is the prime rate charged by banks in June for that year, quoted from the Kansas City Federal Reserve Bank. Multiplying the interest rate by June wheat price and then dividing the product by 365 days gives interest cost per day. The June wheat price is the June price quote for wheat in Oklahoma for that year from the National Ag Statistics Service. The cost of carry is then figured per day. Table 3 shows the interest, storage, and combined carrying costs per day.

[1] There are weekend sales during harvest.

Table 3. Interest, Storage, and Carrying Costs

Year	Interest Rate[a]	Wheat Price $/bu[b]	Interest Cost/day cents/day[c]	Storage/day cents/day[d]	Cost of Carry/day cents/day[e]
92	8.50%	$3.27	.075	.085	.160
93	8.00%	$2.54	.070	.085	.155
94	9.25%	$3.07	.081	.085	.166
95	11.00%	$3.88	.096	.085	.181
96	10.25%	$5.48	.090	.085	.175
97	10.25%	$3.28	.090	.085	.175
98	9.75%	$2.62	.085	.085	.170
99	11.50%	$2.31	.101	.085	.186
00	9.00%	$2.50	.079	.085	.164

[a] Current year prime rate plus 2%
[b] First day of harvest wheat price for current year
[c] Product of interest rate and wheat price
[d] Average storage costs that elevators charge
[e] Sum of interest costs and storage costs

The selling prices net of interest and storage costs are

(1) $$netprice_{itd} = P_d - d\left(\frac{P_0(z_t + .02)}{365} + S_d\right)$$

where i is the producer, t is the year, d is the number of days after harvest, $netprice_{itd}$ is the net price, P_d is the price received on day d, P_0 is the harvest price for that year, z_t is the prime interest rate for that year, and S_d is the storage cost/day.

Procedures

The procedures include linear regression, style indicators (descriptive statistics), and performance persistence tests. The regression model estimates the effect on price of the degree of activeness. Style indicators measure activeness and timing of producers' marketing styles. The performance persistence tests use rank correlations across years to determine if some producers consistently receive a higher price than other producers.

Regression Model

The following regression is used to determine the effect of an active marketing style on price received:

(2) $$lprice_{it} = \beta_0 + \sum_{j=1}^{8} \beta_{1j} year_{jt} + \beta_2 awk_{it} + \beta_3 activeness_i + \varepsilon_{it}$$

where i is the producer, t is the year, $lprice_{it}$ is the log of the bushel-weighted net price for producer i in year t ($aprice_{it}$), $year_t$ is a dummy variable for each year, awk_{it} is the yearly bushel-weighted mean weeks after harvest when wheat was sold by producer i, $activeness_i$ is the standard deviation of awk_{it} by producer, and ε_{it} is the error term.[2] The plots of error terms versus awk_{it} for the OLS model with $aprice_{it}$ as function of $year_t$, awk_{it}, and $activeness_i$ exhibited heteroskedasticity with variance increasing for either high or low values of awk_{it} and thus (2) is estimated using maximum likelihood. The plots are shown in figure 1. The plots demonstrated the need for a quadratic adjustment to the model. The error, ε_{it}, is defined to be heteroskedastic as

(3) $$\varepsilon_{it} \sim N(0, \sigma_i^2)$$

and the variance of ε_{it} (σ_i^2) is defined as

(4) $$\sigma_i^2 = \exp(\alpha_0 + \alpha_1 awk_{it} + \alpha_2 awk_{it}^2).$$

The coefficient of interest is β_3. If β_3 is positive, an active style yields a higher price received. Random effects need to be tested because the regression uses panel data and there is a possibility that some omitted variables may be constant over time, but differ between producers. To measure this, random effects are tested using a likelihood ratio test.

The standard deviation of mean week sold, $activeness_i$, is calculated as follows. First the bushel weighted mean week sold is

(5) $$awk_{it} = \sum_{w=1}^{48} (tvol_{itw} wk_{itw}) / tvol_{it}$$

where w is the week[3], $tvol_{itw}$ is the bushels sold by producer i in year t and week w, wk_{itw} is the weeks after harvest that the transaction occurred, and $tvol_{it}$ is total bushels sold by producer i in year t. The standard deviation of mean week is

(6) $$activeness_i = \sqrt{\frac{\sum_{t=1}^{n} (awk_{it} - \overline{awk_i})^2}{n-1}}$$

where n is the number of years and $\overline{awk_i}$ is the mean of awk_{it} for each producer. The higher the standard deviation, the more active is the producer's style. It is more active because each year the producer is selling in different weeks, whereas with a mechanical style a producer would sell more consistently in the same weeks forcing the standard deviation to be low.

The dependent variable in (2) is the natural log of the annual bushel weighted price by producer, $aprice_{it}$. The annual bushel-weighted mean price is

(7) $$aprice_{it} = \sum_{d=1}^{w=365} (bu_{itd} netprice_{itd}) / tvol_{it}$$

where i is the producer, t is the year, d is the day, bu_{itd} is the bushels sold that day by a producer, and $tvol_{it}$ is yearly total volume of bushels sold per producer.

[2] Number of transactions, $trans_{it}$, and transaction standard deviation, $transsd_t$, were also considered but were not significant and were dropped from the model since theory to support their inclusion was weak.
[3] Based on four-week harvest, so 48 weeks in a marketing year. Harvest is week 1.

Style Indicators

The number of transactions per year is an alternative measure of classifying producers' marketing styles. Barber and Odean (2001) argued that some stock market investors trade too often and reduce their profits, however wheat producers are not charged for more frequent trading. Brorsen and Anderson suggest farmers may spread out their sales to reduce price risk. To measure if farmers are following the advice to spread sales, style indicators are used to measure timing of sales. The standard deviation of mean number of transactions, *transsd,* helps to determine if producers are changing their styles every year. It is calculated by

$$transsd_i = \sqrt{\frac{\sum_{t=0}^{n}(frequency_{it} - \overline{frequency_i})^2}{n-1}} \tag{8}$$

where $frequency_{it}$ is the annual number of weeks a producer has a transaction and $\overline{frequency_t}$ is the mean of $frequency_{it}$ for each producer. If the standard deviation is high then producers are not following a specific pattern, however if it is low then they could be following a specific pattern of selling the same amount of transactions every year.

To further investigate if a specific style is being followed; the standard deviation of week within a year for each producer, $separation_{it}$, is considered to measure producers' separation of transactions during the year. It assists in figuring out if producers' transactions for those who have more than one transaction are separated by a large or small amount of weeks. It is calculated by

$$separation_{it} = \sqrt{\frac{\sum_{w=1}^{48}(week_{itw} - awk_{it})}{w-1}} \tag{9}$$

where w is weeks after harvest (with four week harvest equal to week 1) and $week_{itw}$ is the week with a transaction for each producer for each year for every week.

Performance Persistence

Performance persistence is measured using rank correlations similar to Irwin, Martines-Filho, and Good and Harri and Brorsen. First the producers' prices are averaged over three years, producing seven three-year averages. Then the producers are ranked from 1 to p (p is the number of producers) based on their three-year price performance. Three-year price performance is the three-year average of each producer's $aprice_{it}$. If a producer is missing more than one year out of the three used to make the three-year average, then the observation is deleted. A correlation matrix is produced to measure the rank correlations between the seven three-year price performance ranks. The rank correlation, is the correlation between a three-year price performance rank and the consecutive three-year price performance rank. Out of the seven price performance ranks, there will be four rank correlations. These four rank correlations are averaged to establish a total average correlation, ρ.

The hypothesis of no performance persistence is tested using a parametric bootstrap similar to that of Harri and Brorsen. Standard procedures are not applicable because of the overlapping data. The null hypothesis tested is H_o: $\rho = 0$ against the alternative H_a: $\rho > 0$, where ρ is the average of the four correlations. The Monte Carlo simulation generates data from a random normal distribution with the same number of observations as the original data for each year. The simulation was done imposing no correlation. Next, the total average correlation for that sample set is found using the same method as the original data. This process is completed 10,000 times to develop 10,000 different average correlations, $\hat{\rho}$. The p-value is then found by taking the percentage of the simulated total average correlations that were greater than the original data's total average correlation:

(10) $$p - value = \sum_{m=1}^{q} I(\hat{\rho}_m > \rho)/q$$

where I is 1 if the argument is true and 0 if false, $\hat{\rho}_m$ is the average correlation calculated from the m^{th} replication, and q is the number of Monte Carlo replications.

Results

Regression Model

Estimates of the regression in equation (2) are shown in tables 4, 5, and 6.

Table 4. Wheat Price Parameter Estimates for the Southern Elevator

Parameter	Estimate	t-value	Pr > |t|
Intercept	1.16420	58.51	<. 0001
1992	.06030	2.47	.0138
1993	.02545	1.02	.3075
1994	.02698	1.11	.2686
1995	-.00685	-.29	.7751
1996	-.07795	-3.22	.0013
1997	.01730	.72	.4738
1998	.02952	1.18	.2388
1999	.02697	1.03	.3031
2000	0		
Awk	-.00592	-10.82	<. 0001
Activeness	.00130	1.21	.2266
χ^{2a}	28.45		<. 0001

[a] Tests the null hypothesis of no heteroskedasticity, using a likelihood ratio test.

Table 5. Wheat Price Parameter Estimates for the Central Elevator

Parameter	Estimate	t-value	Pr > |t|
Intercept	.9236	127.98	<. 0001
1992	.2052	26.83	<. 0001
1993	.1588	21.77	<. 0001
1994	.2820	37.60	<. 0001
1995	.5930	82.07	<. 0001
1996	.5023	66.84	<. 0001
1997	.2006	26.65	<. 0001
1998	-.0252	-3.40	.0007
1999	-.1907	-23.93	<. 0001
2000	0		
Awk	-.00170	-9.38	<. 0001
Activeness	.00004	.09	.9301
χ^{2a}	281.72		<. 0001

[a] Tests the null hypothesis of no heteroskedasticity, using a likelihood ratio test.

Table 6. Wheat Price Parameter Estimates for the Northern Elevator

Parameter	Estimate	t-value	Pr > |t|
Intercept	.9573	103.84	<. 0001
1992	.1724	18.82	<. 0001
1993	.1668	20.14	<. 0001
1994	.2796	33.42	<. 0001
1995	.6047	75.37	<. 0001
1996	.4598	58.84	<. 0001
1997	.1781	22.59	<. 0001
1998	NA	NA	NA
1999	-.2204	-27.62	<. 0001
2000	0		
Awk	-.00134	-5.37	<. 0001
Activeness	-.00009	-.14	.8849
χ^{2a}	182.77		<. 0001

[a] Tests the null hypothesis of no heteroskedasticity, using a likelihood ratio test.

The null hypothesis of no heteroskedasticity was rejected in each case. The null hypothesis was H_0: $\alpha_1 = \alpha_2 = 0$ and the likelihood ratio statistic has a χ^2_α distribution under the null. The parameter estimates for the variance equation (4) are presented in table 7. They show that error variance is larger at the beginning and end of the marketing season, which is likely due to including a fixed effect for year in the model.

Table 7. Estimates of the Multiplicative Variance Equation by Elevator

Alphas	Explanatory Variable	Southern	Central	Northern
Intercept		.0427	.0146	.0168
Average Week Sold	awk_{it}	-.0451	-.1527	-.1863
Average Week Sold Squared	awk_{it}^2	.0013	.0040	.0043
LR Statistic[b]	χ^2	28.45	281.72	182.77

[b] The null hypothesis is homoskedasticity H_o: $\alpha_1 = \alpha_2 = 0$.

The parameter estimates for the regression in each region show that the activeness of a producer's style is not related to price. Producer's who attempt to beat the market by actively trading are not successful. However, the parameter of awk_{it} shows that the later a producer sells wheat, the lower the expected price received. Oklahoma's harvest is early in the marketing year and is closer to export markets than most wheat-producing states. Therefore, as Benirschka and Binkley argue, the returns to storage in Oklahoma should be low. When awk_{it} was regressed as a function of $activeness_i$, the relationship was significant and positive. This could be interpreted, as farmers who have an active style tend to store longer and thus receive a lower price. But, a producer always selling at harvest would have activeness of zero. A producer who sells later will be unlikely to always sell the same week and thus be measured as being more active.

The model was also estimated including random effects for each producer. The test showed no random effects, which provides further evidence that the marketing style a particular producer uses, makes little difference.

Style Indicators

Figure 2 shows histograms for average week[4] producers sell wheat. At the southern elevator most wheat was sold at harvest and then sales quickly dropped off as the marketing year progressed. However, the northern and central elevators experienced a growth in sales with a peak at week eighteen. At the central elevator, sales slowly declined through the marketing year, while the northern elevator's sales remained steady and then quickly dropped three-quarters of the way through the marketing year. Southern producers market their wheat close to harvest, while producers at the central and northern elevators market wheat throughout the year. The southern producers have higher negative returns to storage than the northern and central producers, according to the first regression. This may explain why more southern producers sell at harvest. Earlier sales at locations closer to the Gulf are consistent with Benirschka and Binkley.

Figure 3 shows standard deviation of each producer's average week they sell wheat ($activeness_i$). This measures whether a producers is selling at the same time every year or is actively changing when he markets his wheat. The histogram for the southern elevator shows that 20 percent of the producers sell wheat within the same 2 weeks of their yearly mean marketing week. Thus showing that southern producers market their wheat close to the same time every year. The other

[4] Week 1 is harvest and is four weeks long. Week 2 would be the fifth week after harvest started.

histograms for the northern and central elevator show that producers have a more active style, changing their average sale week from year to year. These producers are changing the timing of their sales yearly rather than consistently marketing their wheat in the same month or week every year. This activeness is probably related to producers holding a portion of wheat in some years and not storing any in others, or some other active style. The producers selling with a standard deviation of 2 weeks or less are likely to be producers who always sell at harvest.

Figure 4 shows $frequency_{it}$ for all three elevators. These histograms show how many weeks producers sell wheat. The histograms illustrate producers usually market wheat one week per year. In fact, at every elevator over 50% of producer have only one transaction. The histograms also show that only around 10% of producers have more than 3 weeks with transactions. At all the elevators there were producers that had more than 10 weekly transactions per year, but at the northern elevator there is a slight increase.

Figure 5 shows $transsd_i$, standard deviation of $frequency_{it}$. The histograms reveal that producers tend to have the same number of transactions each year. At every elevator nearly 80% of all producers have a standard deviation of one week. This means that producers do not vary the number of weeks in which they sell wheat. From figures 4 and 5, it can be interpreted that producers will typically have 1 transaction week every year and will not change the number of transactions from year to year by more than one week of transactions. Producers are not as active with their 'number of weeks with transactions' as they are with the weeks when they choose to make these transactions.

Figure 6 explains the separation of sales during the year for the producers, this is the variable $separation_{it}$. The histograms show how far apart the transactions are within a year. It can easily be seen that once producers decide to market wheat they sell it all very quickly. In fact, when looking at the histogram they sell within 2 weeks of the mean marketing week for that year. This means that producers are not spreading out their sales during the year, instead they typically have their wheat sold within 4 weeks of the mean transaction week after harvest for that year. This illustrates that producers are making little use of spreading sales to reduce price risk. The histogram reflects that there are many producers with only one transaction per year.

At the southern elevator, producers favor selling at harvest; while at the other two elevators, producers favor selling later. Producers at all the elevators typically sell close to the same number of weeks every year. Nearly 90% of producers have less than 4 weeks with a transaction. Even though producers appear to be less active when examining weeks with a transaction, it is not true for average week wheat is sold. Producers appear to change the timing of their sales regularly. Therefore, producers are less active with respect to number of weeks they sell wheat, but more active with respect to the weeks they market their wheat in.

Performance Persistence

For the performance persistence test, the null hypothesis is H_o: $\rho=0$ and is tested against the alternative H_a: $\rho>0$, where ρ is the average correlation. In table 8 the p-value and average correlations for the elevators are shown. Because the p-values are large there is not enough evidence to reject the null hypothesis

Table 8. Average Correlation and P-Values

Elevator	Average Correlation	p-Value
Southern	.0180228	.3748
Central	-.08661	.9706
Northern	-.168387	.9963

of no correlation. From this, it can be concluded that producers do not have performance persistence. This conclusion of no performance persistence is consistent with the efficient markets theorem of farmers receiving an average price over time.

Conclusion

The paper measured the extent to which the styles used by producers are either active or mechanical. In most cases producers appear mechanical (not changing their marketing style from year to year) with respect to number of sales and active (changing their marketing style from year to year) with respect to timing of sales. Southern producers appear to use a basic overall mechanical style, with sales occurring at or near harvest every year. The producers at the other elevators have a more active style. The results did not reveal any differences in net price received between producers that used an active style, with respect to market timing, and those that used a mechanical style. Time had a negative effect on price, but this is possibly due to assuming full cost of carry. Some producers may not have the same cost of carry. A producer's actual cost of carry could be higher or lower than the one used in this study, and therefore could alter the effect time has on net price received.

Producer performance persistence was tested using a bootstrap. The test showed no evidence of performance persistence. The lack of performance persistence and insignificance of the activeness variable on price received supports the efficient market hypothesis. In conclusion, from the research done in this paper, there does not appear to be any benefit for producers to fight the market. In addition, when including the storage and interest cost applied in this paper, time appears to have a negative effect on price and thus there is some evidence that producers store too long.

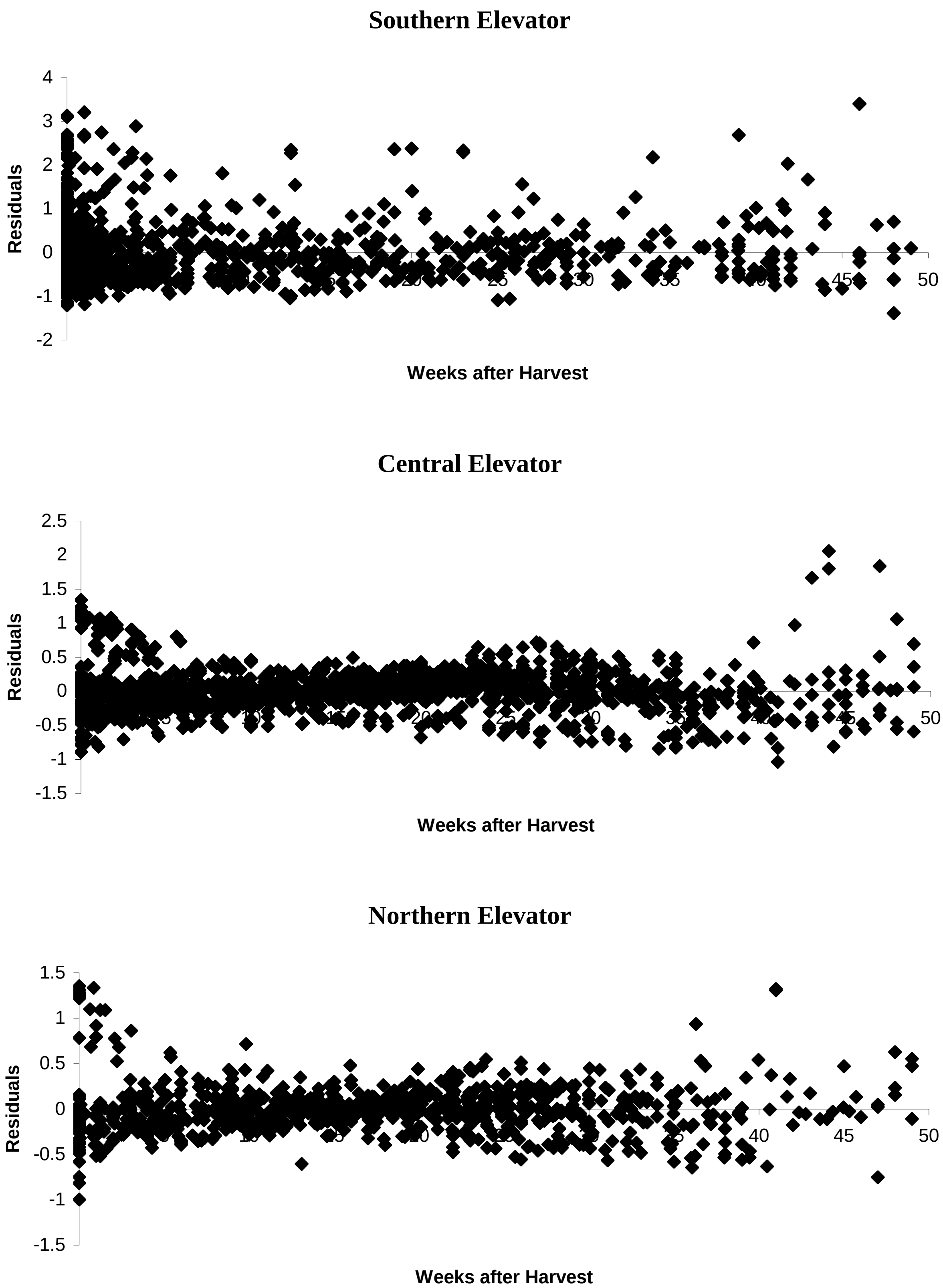

Figure 1. Elevator Residual Plots

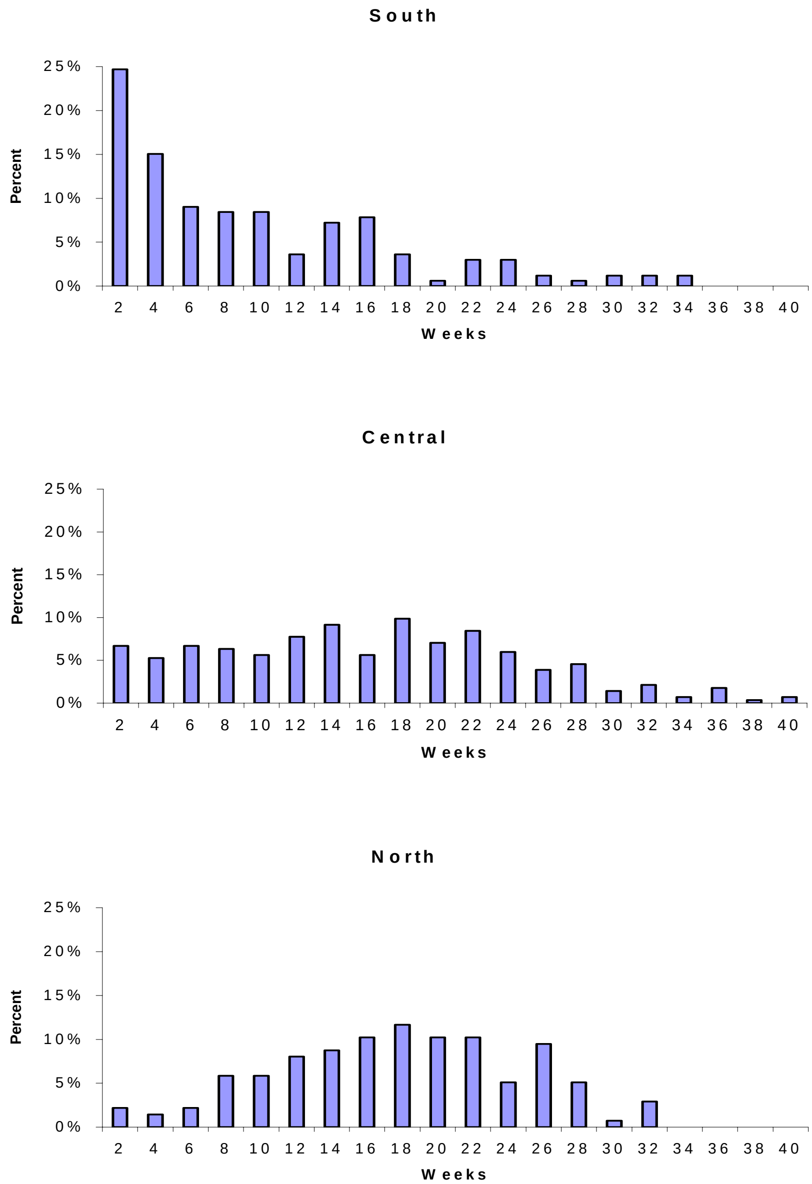

Figure 2. Histograms of average sales date (*awk_{it}*)

Note: Harvest is 4 weeks long, and thus the 2 represents the first 5 weeks of the crop year. Weeks is the mean number of weeks after harvest (with the four week harvest being week 1) that a producer sold wheat in a particular year. Percent is the percent of producers with an average sale week in the 2 week interval.

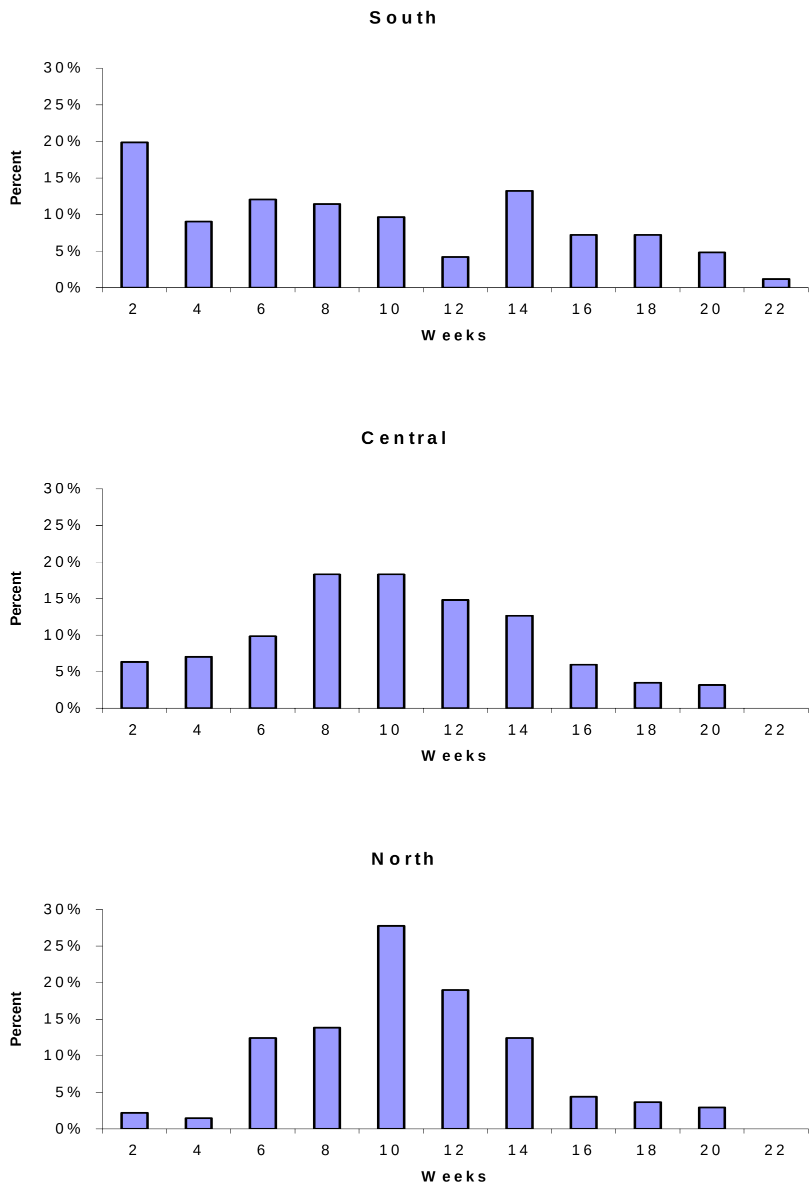

Figure 3. Standard Deviation of *awk_{it} (activeness$_i$)*

Note: The weeks represent the number of weeks in which a producer may deviate from the mean week that a producer markets their wheat. If weeks is equal to 4 then the producer will market their wheat within greater than 2 weeks and less than or equal to 4 weeks of the mean. Percent represent the percentage of producers with that specific standard deviation of mean week.

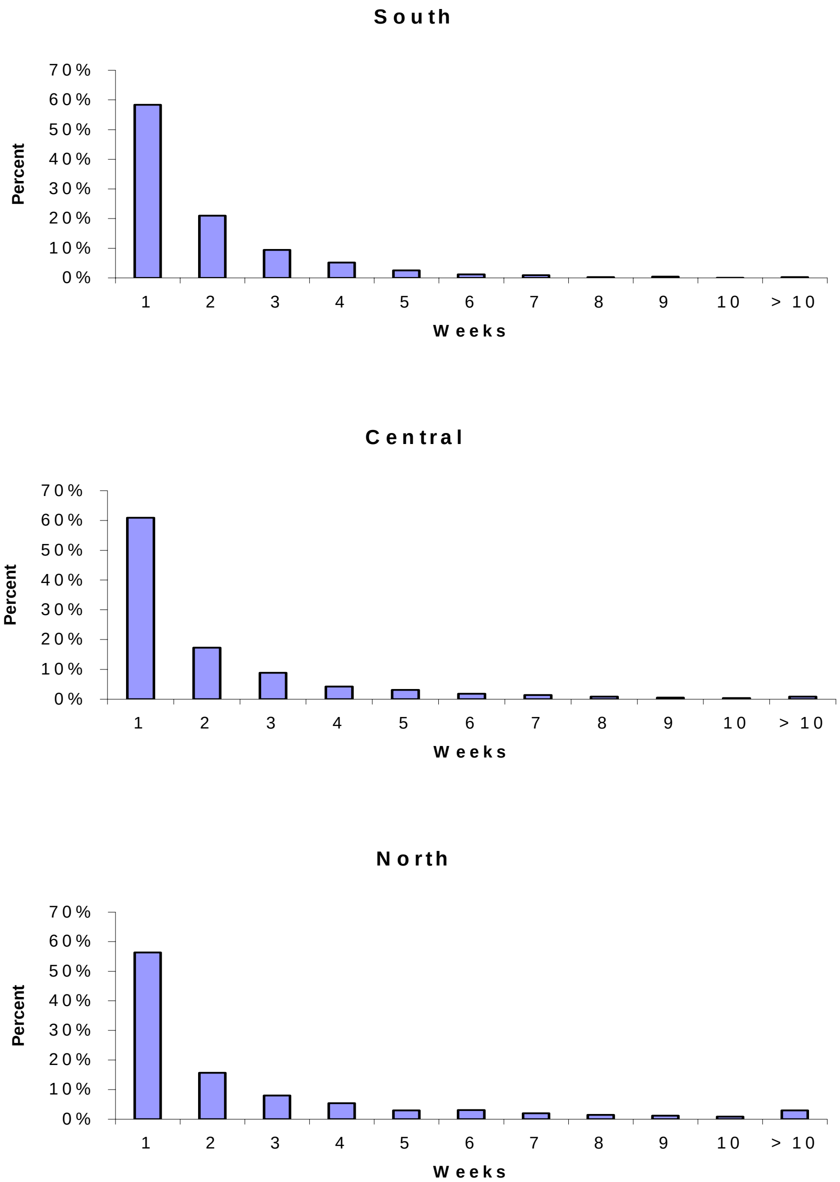

Figure 4. Producer Average Number of Sale Weeks (*$frequency_{it}$*)

Note: Weeks represent the mean number of weeks that a producer has a transaction for all years. If weeks is equal to 1 then a producer will average no more than 1 week with a transaction. If weeks is equal to 2 then a producer will average more than 1 week with a transaction, but no more than 2 weeks. Percent is the percent of producers that have an average number of transactions for that 1 week interval.

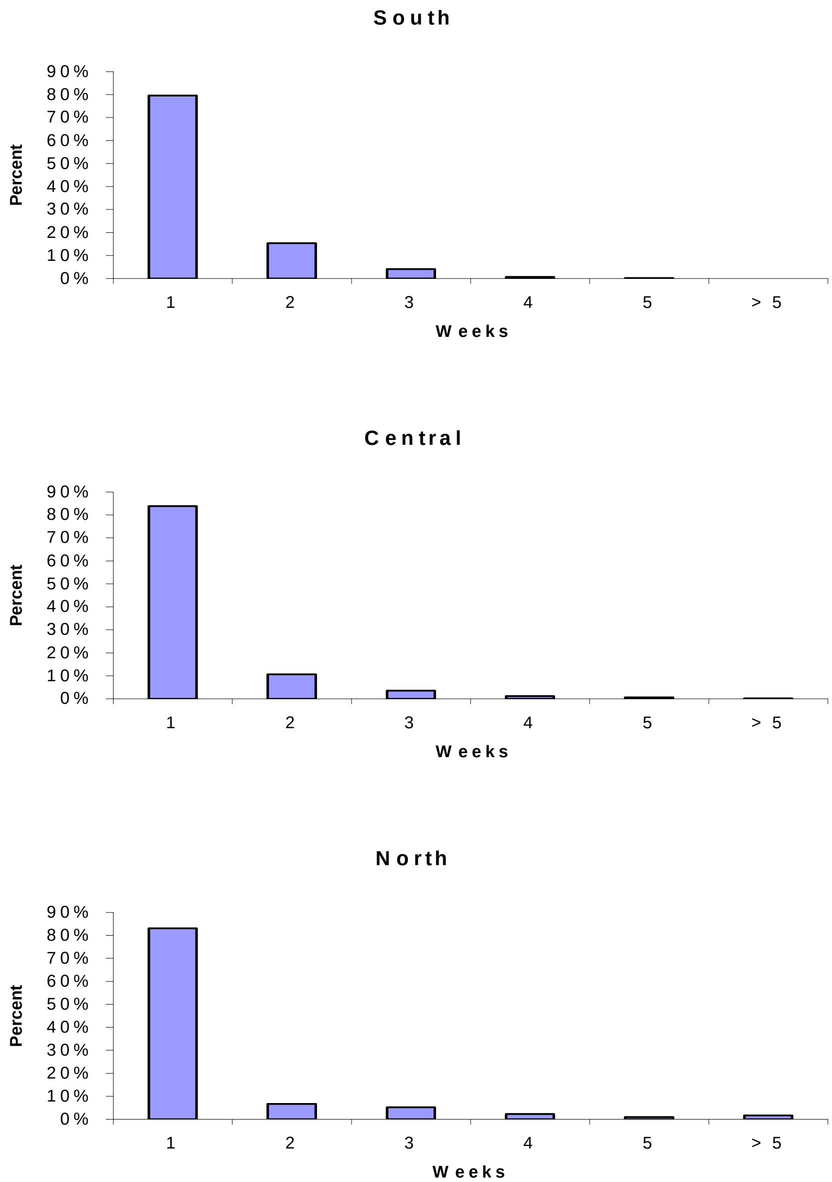

Figure 5. Standard Deviation of Average Number of Sale Weeks (*$transssd_i$*)

Note: Weeks is number of weeks with a transaction that a producer may deviate from the mean number of weeks with a transactions from year to year. If weeks is equal to 1 then a producer will deviate 1 week or less from the mean number of weeks with a transaction. Percent is the percentage of producers that have that number of weeks as their standard deviation for number of weeks with a transaction.

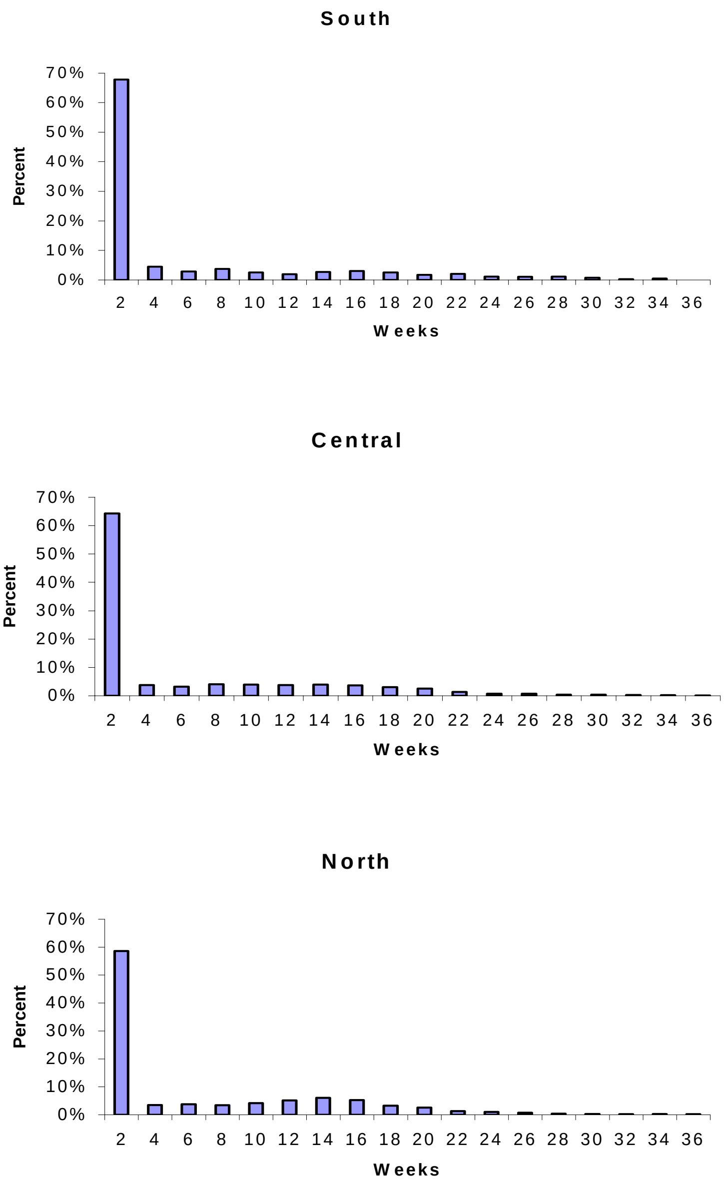

Figure 6. Separation

Note: Weeks measures how far apart a producer's week with a transaction are for every year. If week is equal to 4 then a producer will sell his wheat every year between greater than 2 week and less than or equal to 4 weeks of their average sale week for that year. Percent is the percentage of producers that fall within that 2 week interval for that year.

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