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Marketing Strategies for Soybeans in 1997-2012: Performance Persistence and Risk-return Tradeoffs

by

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Marketing Strategies for Soybeans in 1997-2012:
Performance Persistence and Risk-return Tradeoffs.

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Marketing Strategies for Soybeans in 1997-2012: Performance Persistence and Risk-return Tradeoffs.

This working paper discusses preliminary ideas of a research project that explores the performance of marketing strategies. In this first step only strategies using futures contracts for soybeans are examined. A set of 26 marketing strategies was simulated between 1997 and 2012 based on November futures prices and cash prices in Nebraska. Initial findings suggest that mean returns tend to be higher (lower) when larger (smaller) portions of crop are sold with futures contracts, and when those sales happen in the summer (spring and fall). However, those strategies that yield higher returns also bring larger dispersion of returns, which raises the need to discuss tradeoffs between risk and return. Finally, it was investigated whether a group of strategies could consistently outperform the others, but no evidence was found to support this idea.

Keywords: commodity marketing, performance persistence, risk, return.

INTRODUCTION

Marketing decisions are a vital component of farm management. Producer's business success is based not only on their technical knowledge of production, but also on their capacity to make sound marketing choices while coping with risk. Price received by producers has often been important to explain variation in their management performance across time (Zulauf et al., 2006). Although attributes such as cost and yield management are generally more significant to explain differences in profits across producers, Dhuyvetter et al. (2011) indicate that "price has become increasingly significant in explaining profitability differences across producers" (p.14).

The importance of marketing decisions is accompanied by its complexity. Producers can market their crops over several months, can choose to spread their sales over their marketing window, and can use several marketing tools (forward and futures contracts, among others). All these dimensions generate a large number of marketing strategies, with many combinations of dates, proportion of production sold and marketing contracts. Recent developments in commodity markets added another layer of complexity to marketing decisions, with new uses for grains, weather uncertainty, changes in basis patterns and large swings in commodity prices (Adjemian et al., 2013; Zilberman et al., 2012; Trostle et al., 2011; Trostle, 2008).

The objective of this research is to conduct a comprehensive examination of marketing strategies for grain producers in Nebraska between 1997 and 2013. More specifically, this study will investigate changes in price and basis behavior over time in grain markets, explore the effectiveness of marketing strategies for grains in Nebraska in terms of risk and return, compare and rank marketing strategies with respect to risk and return, and examine how market conditions affect the effectiveness of marketing strategies over time.

Producers can benefit from an extensive analysis of the performance of marketing strategies over time, including a closer look into how recent changes in commodity markets might have affected different strategies.

This working paper discusses how the research will be conducted and presents preliminary results for soybean marketing strategies using futures contracts. More commodities and more strategies will be included in further steps of the project.

RESEARCH METHOD

For the period of 1997-2012, 26 marketing strategies with futures contracts were simulated. Each strategy was simulated 1,000 times. For example, the strategy would be simulated for each year and then an average result across all years would be calculated, then the simulation would be repeated another 999 times. The strategies were constructed so that each year the producer would sell a portion of their crop with a November's futures contract sometime between February and September and then would offset the futures position and sell the entire crop in the local cash market in October (Table 1).

Table 1: Marketing strategies used in the analysis

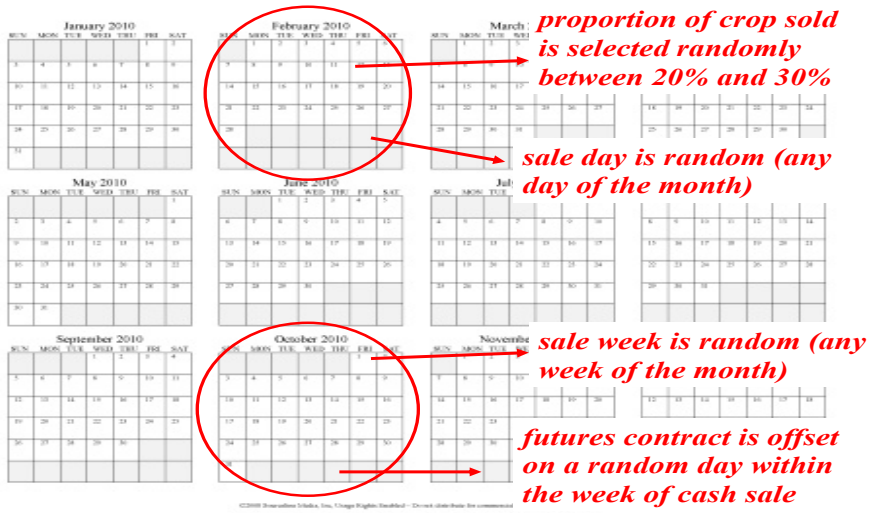
Strategies	Month in which grain was sold with futures contracts	Approximate proportion of crop sold in each month [(a)]
1 - 3	February	25%, 50%, or 75%
4 - 6	March	25%, 50%, or 75%
7 - 9	April	25%, 50%, or 75%
10 - 12	May	25%, 50%, or 75%
13 - 15	June	25%, 50%, or 75%
16 - 18	July	25%, 50%, or 75%
19 - 21	August	25%, 50%, or 75%
22 - 24	September	25%, 50%, or 75%
25	Spread over 8 months above	11% in each month
26 [(b)]	Random (February-September)	11%, 25%, 50%, or 75%

(a) For 25%, the actual proportion was randomly picked between 20% and 30%, for 50% it was randomly picked between 45% and 55%, for 75% it was randomly picked between 70% and 80%, and for 11% it was randomly picked between 10% and 12%. (b) Strategy 26 is based on random combination of strategies 1 to 25 across years. In each year a random strategy is selected to be simulated.

For strategies 1 through 24, the producer would sell a portion of the crop with the November futures contract in one of eight months (February through September). In October, the producer would offset the futures position and sell the entire crop in the local cash market. In strategies 1 through 24, the futures sale occurs in only one month and the portion of the crop sold with the futures contract was approximately 25% (random pick between 20% and 30%), 50%

(random pick between 45% and 55%), or 75% (random pick between 70% and 80%). For example, in strategy 1 the producer would sell approximately 25% of the crop, selected randomly between 20% and 30%, in February using November futures contracts and the sale day would be randomly chosen as any day within that month. Then, in October, the producer would sell his entire crop in the local cash market (during a randomly selected week of the month) and the futures contracts would be offset on a random day within the week of the cash sale (Figure 1). Strategies 2 to 24 follow the same procedure, accounting for different proportions of crop sold and different months to sell the grain with November futures contracts.

Figure 1: Illustration of strategy 1



In strategy 25, sales were spread evenly over eight months. Every year the producer will sell a portion of the crop with November futures contracts every month from February to September. In each month the day when the futures contract is traded is randomly selected. The producer would then offset all futures positions and sell the entire crop in the local cash market in October. Again, the cash sale is executed in a randomly chosen week in October, and the futures position is offset in a randomly chosen day in that week. This strategy assumes that the futures sales are approximately equal every month, such that the portion of the crop sold each month with the futures contracts is randomly selected between 10% and 12%.

The final strategy, consists of random sales in each year that are based on any combination of the previous strategies. Then in October, the futures positions are offset and the entire crop is sold in the local cash market. In this strategy, for example, in 1997 they may sell 75% of their crop with a futures contract in April, then in 1998 they may spread the sales equally over 8 months, in 1999 they may sell 21% of their crop with a futures contract in September, and then in 2000 they may sell 54% of their crop with a futures contract in July, and so on.

Results of each strategy are expressed as a return relative to the cash price to determine whether selling a portion of the crop on the futures market is better than just selling in the spot market in October. This was calculated where the final price received by the producer for each strategy was divided by the cash prices. For example, if the return for a strategy is 3.7%, this means that marketing with a futures contracts generated a price 3.7% higher than would have been obtained by selling only in the spot market in October. A return that is greater than (less than) zero would equate to the futures strategy performing better (worse) than the simple spot sale in October.

It is also interesting to investigate whether certain marketing strategies can consistently outperform or underperform others over time. The winners and losers rank test was used to evaluate the performance of all strategies during the sample period. The winners and losers rank test is a non-parametric test that tests whether strategies are consistently "winners" or "losers". In order to calculate the test, each strategy is ranked by return for each year. Strategies whose return is above the median are considered winners while strategies whose return are below the median are considered losers. Pairs of adjacent years are created and then the number of strategies are counted based on who are winners and losers in each year. If performance is random, we should expect that 50% of winners (losers) in year t will be winners (losers) in year t+1 and 50% of winners (losers) in t will be losers (winners) in year t+1. The hypothesis that conditional independence exists (or that the performance is random) can be tested using the Fisher's Exact test.

DATA

A dataset of cash and futures prices was used for this research. Weekly cash prices collected by USDA were used based on Beatrice, located in southeastern Nebraska. Daily futures prices were obtained from the Chicago Board of Trade for November delivery, based on the closing of the day. Transaction costs in the futures market were assumed to be $0.02 per bushel for the entire period. In strategies 1-24, when futures contracts were traded only once, one transaction cost was charged for entering and offsetting the contract. In strategy 25, when futures contracts were traded every month from February to September, eight transaction costs were charged. In all cases, transactions costs were subtracted from the futures price obtained by the producer when selling soybeans with a futures contract.

Figure 3 (Appendix) shows cash and futures prices for each year of the sample period. The price charts suggest diverse behavior over the years, with upward and downward swings during the year and also varied movements of cash and futures prices relative to each other. Table 2 presents summary statistics of November futures prices between 1997 and 2012. The numbers indicate larger price ranges in later years and more variability in futures prices after 2002, suggesting more dispersion in returns obtained from transactions in futures markets. A further look into this point can be taken in Figure 4 (Appendix), which shows histograms of November futures prices by year with a shaded area representing the range in cash prices in October of each year. For example, in 1998 almost the entire distribution of November futures

prices is located to the right of the cash price range, indicating that marketing strategies using futures contracts would mostly achieve positive returns (i.e. final price received from marketing strategy would be higher than price obtained from simple cash sale in October). Figure 4 (Appendix) shows diversity of behavior of November futures prices relative to October cash prices, but it appears that futures prices histograms tend to lie generally to the right of cash price ranges in earlier years. However, this tendency does not seem as clear in later years.

Table 2: Summary statistics of November futures prices – 1997 to 2012

Year	Mean	CV	Max	Q3	Median	Q1	Min
1997	6.73	0.05	7.44	7.01	6.85	6.46	5.84
1998	5.95	0.07	6.84	6.32	5.99	5.57	5.11
1999	4.89	0.06	5.73	5.03	4.88	4.73	4.11
2000	5.11	0.07	5.84	5.39	5.18	4.75	4.47
2001	4.60	0.06	5.24	4.79	4.55	4.38	4.19
2002	5.01	0.08	5.89	5.39	5.04	4.64	4.30
2003	5.80	0.13	8.00	6.09	5.58	5.23	5.04
2004	6.38	0.13	7.88	7.09	6.45	5.66	5.02
2005	6.15	0.08	7.66	6.36	6.08	5.78	5.20
2006	6.17	0.07	7.40	6.28	6.11	5.96	5.38
2007	8.81	0.11	11.26	9.74	8.54	7.99	7.13
2008	12.09	0.17	16.31	13.48	12.40	10.35	8.02
2009	9.59	0.07	10.88	10.08	9.63	9.17	7.91
2010	10.23	0.11	13.30	11.03	9.75	9.27	8.94
2011	13.07	0.06	14.57	13.68	13.34	12.45	11.19
2012	14.14	0.11	17.68	15.51	13.54	12.95	11.70

RESULTS

All 26 marketing strategies were simulated and analyzed in each year of the sample period. As suggested by the preliminary data discussion, there is large variability in returns across strategies and across years. Table 3 shows summary statistics for annual mean returns from the simulated marketing strategies across years. For example, the strategy of selling 25% of crop with futures contracts in February (25 Feb) yielded, on average, a mean return of 0.45%; the highest mean return was 10.48% while the lowest mean return was -6.31%. Overall, strategies that price larger portions of the crop with futures contracts seem to have higher mean returns, and those that sell in the summer appear to yield higher mean returns compared to spring and fall sales. However, the dispersion of returns also varies across strategies.

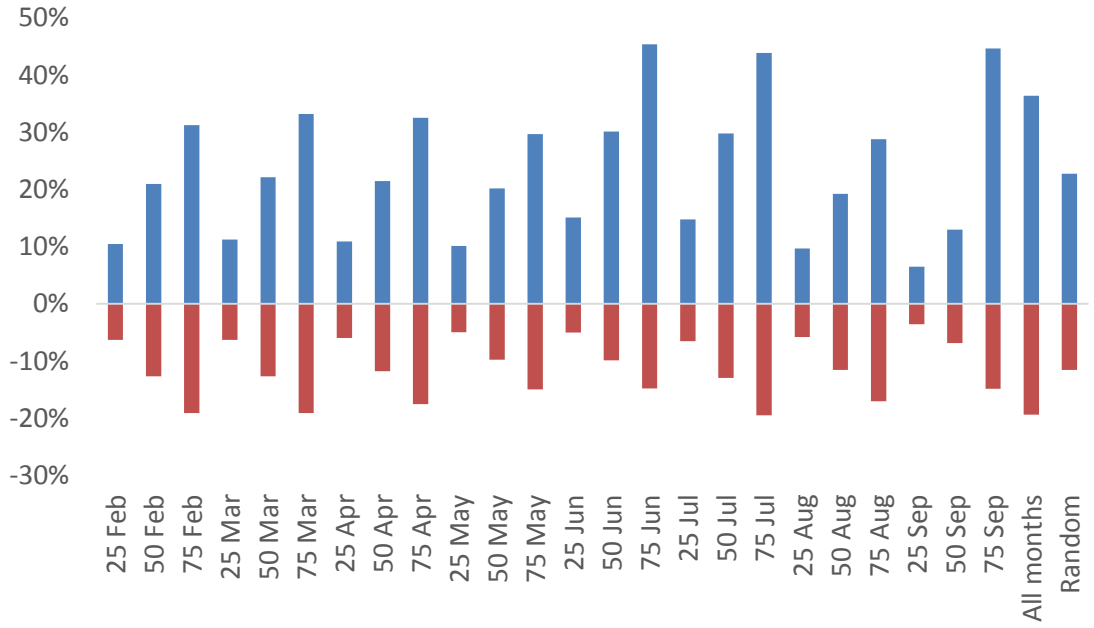
Table 3: Summary statistics for annual mean returns across years – 1997 to 2012[a]

Strategy[b]	Average	Maximum	Q3	Median	Q1	Minimum
25 Feb	0.45%	10.48%	2.02%	0.51%	-2.96%	-6.31%
50 Feb	0.89%	20.99%	4.00%	1.08%	-5.89%	-12.67%
75 Feb	1.30%	31.26%	5.97%	1.78%	-8.75%	-19.10%
25 Mar	0.73%	11.24%	2.38%	0.92%	-3.25%	-6.27%
50 Mar	1.45%	22.14%	4.78%	1.89%	-6.53%	-12.65%
75 Mar	2.22%	33.23%	7.16%	2.77%	-9.71%	-19.09%
25 Apr	0.70%	10.90%	2.57%	0.15%	-2.56%	-5.97%
50 Apr	1.42%	21.50%	5.10%	0.26%	-5.11%	-11.79%
75 Apr	2.15%	32.56%	7.80%	0.36%	-7.69%	-17.53%
25 May	0.91%	10.12%	2.94%	0.29%	-3.02%	-4.93%
50 May	1.84%	20.18%	5.81%	0.56%	-6.01%	-9.75%
75 May	2.63%	29.70%	8.46%	0.78%	-9.19%	-14.96%
25 Jun	1.28%	15.09%	2.17%	0.42%	-1.40%	-4.98%
50 Jun	2.56%	30.14%	4.32%	0.90%	-2.78%	-9.85%
75 Jun	3.77%	45.44%	6.26%	1.02%	-4.26%	-14.82%
25 Jul	1.02%	14.78%	3.04%	0.09%	-1.75%	-6.50%
50 Jul	2.02%	29.83%	6.07%	0.13%	-3.57%	-12.96%
75 Jul	2.97%	43.88%	9.11%	0.28%	-5.29%	-19.49%
25 Aug	0.56%	9.71%	2.70%	-0.41%	-1.38%	-5.77%
50 Aug	1.13%	19.25%	5.35%	-0.82%	-2.81%	-11.54%
75 Aug	1.71%	28.79%	8.05%	-1.18%	-4.26%	-17.03%
25 Sep	0.42%	6.53%	1.77%	0.40%	-1.16%	-3.58%
50 Sep	0.87%	12.97%	3.45%	0.88%	-2.24%	-6.86%
75 Sep	3.80%	45.06%	6.39%	1.22%	-4.16%	-14.78%
All months	2.70%	36.56%	8.45%	-0.35%	-5.24%	-19.29%
Random	1.65%	23.01%	5.15%	-0.03%	-3.37%	-11.87%

(a) 'Average' refers to the average of mean returns across years, while the other statistics refer to mean returns in specific years; (b) Strategies' names indicate proportion of crop sold with futures contracts and month of futures sale. For example, 25 Feb is the strategy in which 25% of crop is sold with futures contracts in February.

Figure 2 shows maximum and minimum values for each strategy as presented in Table 3 and helps illustrate the variability of returns across strategies over the years. The range of returns tends to increase as larger portions of crop are sold with futures contracts. For example, for the strategy of pricing soybeans with futures contracts in March, the difference between the highest and lowest mean return across the years is 17 percentage points when 25% of the crop is sold and 52 percentage points when 75% of the crop is sold. Similarly, sales during the summer also present larger ranges of return. These ideas are further illustrated by boxplots of the distributions of returns for each marketing strategy in each year. The relatively higher (lower) mean returns for strategies executed in the summer (spring and fall), along with their larger (smaller) range of returns, can be seen in Figure 5 (Appendix).

Figure 2: Maximum and minimum mean returns from the distributions of 26 marketing strategies across years – 1997 to 2012



Finally, performance persistence of the 26 marketing strategies over the years was investigated with the winners and losers rank test. Strategies were ranked by return in each year and then separated into two groups: winners (return above the median) and losers (return below the median). For pairs of adjacent years the null hypothesis of conditional independence in performance was tested, i.e. whether performance across years is random. Results show that the null hypothesis could be rejected only in 4 out of 15 pairs of years, which can be seen in Table 4. In those 4 pairs of years, winners (losers) in year t were more likely to be winners (losers) in year t+1 in 1 pair, while winners (losers) in year t were more likely to be losers (winners) in year t+1 in 3 pairs.

Table 4: Some results of winners and losers rank test

Persistance in return		Number of farmers		Proportion		p-value for two-tail
		Winners t+1	Losers t+1	Winners t+1	Losers t+1	Fisher's exact test
Period t: 2002	Winners t	10	3	76.9%	23.1%	
Period t+1: 2003	Losers t	3	10	23.1%	76.9%	0.02
Period t: 2003	Winners t	3	10	23.1%	76.9%	
Period t+1: 2004	Losers t	10	3	76.9%	23.1%	0.00
Period t: 2007	Winners t	2	11	15.4%	84.6%	
Period t+1: 2008	Losers t	11	2	84.6%	15.4%	0.00
Period t: 2010	Winners t	3	10	23.1%	76.9%	
Period t+1: 2011	Losers t	10	3	76.9%	23.1%	0.02

CONCLUSIONS

This working paper discusses preliminary ideas of a research project that explores the performance of marketing strategies. In this first step only strategies using futures contracts for soybeans are examined. A set of 26 marketing strategies was simulated between 1997 and 2012 based on November futures prices and cash prices in Nebraska. Results were expressed in terms of returns on marketing strategies compared to simple cash sales at harvest, i.e. the percentage difference between the price obtained with the marketing strategy and the price that would have been obtained with a simple cash sale at harvest.

Initial findings suggest that mean returns tend to be higher (lower) when larger (smaller) portions of crop are sold with futures contracts, and when those sales happen in the summer (spring and fall). However, those strategies that yield higher returns also bring larger dispersion of returns. Marketing larger (smaller) portions of crop with futures contracts and during the summer (spring or fall) tend to generate larger (smaller) range of returns. Larger (smaller) positive returns and also larger (smaller) negative returns seem to be more frequent in those distributions with larger (smaller) mean returns.

It was further investigated whether there is evidence of performance persistence, i.e. whether a group of strategies could consistently outperform the others. Based on the winners and losers rank test it was generally not possible to reject the null hypothesis that performance is conditionally independent across years.

Several dimensions will be explored as this research is further developed. The discussion about variability of returns raises the notion of return-risk tradeoff. Strategies that yield higher returns might also bring higher risk, which raises another important issue: how should risk be measured? Different risk measures will be calculated for all marketing strategies and examined with their returns, which will allow to discuss the implied tradeoff between risk and return across strategies. In addition, other marketing strategies will be considered in the analysis, including forward contracts and options, among others.

REFERENCES

Adjemian, M.K., P. Garcia, S. Irwin and A. Smith (2013). Non-Convergence in Domestic Commodity Futures Markets: Causes, Consequences, and Remedies. U.S. Department of Agriculture, Economic Research Service, Economic Information Bulletin 115.

Aulerich, N.M., S.H. Irwin and P. Garcia (2011). Returns to Individual Traders in Agricultural Futures Markets: Skill or Luck? Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. St. Louis, MO.

Cunningham III, L.T., B.W. Brorsen and K.B. Anderson (2007). Cash Marketing Styles and Performance Persistence. American Journal of Agricultural Economics 89, 624-636.

Dhuyvetter, K.C., C.H. Morris and T.L. Kastens (2011). Management Factors: What is Important, Prices, Yields, Costs, or Technology Adoption? AgManager.info, Department of Agricultural Economics, Kansas State University.

Irwin, S.H., D.L. Good and J. Martines-Filho (2006). The Performance of Agricultural Market Advisory Services in Corn and Soybeans. American Journal of Agricultural Economics 88, 162-181.

Trostle, R. (2008). Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices. U.S. Department of Agriculture, Economic Research Service, WRS-0801.

Trostle, R., D. Marti, S. Rosen and P. Westcott (2011). Why Have Food Commodity Prices Risen Again? U.S. Department of Agriculture, Economic Research Service, WRS-1103.

Vyn, R.J. (2012). The Effectiveness of Alternative Marketing Strategies for Ontario Corn and Soybean Producers. Canadian Journal of Agricultural Economics 60, 427-449.

Zilberman, D. G. Hochman, D. Rajagopal, S. Sexton and G. Timilsina (2012). The Impact of biofuels on Commodity Food Prices: Assessment of Findings. American Journal of Agricultural Economics 95, 275-281.

Zulauf, C.R., G. Schnitkey and C.T. Norden (2006). Price and Profit: Investigating a Conundrum. Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. St. Louis, MO.

APPENDIX

Figure 3: Spot prices (Beatrice, NE) and November futures prices for soybeans, November to November (1997–2012)

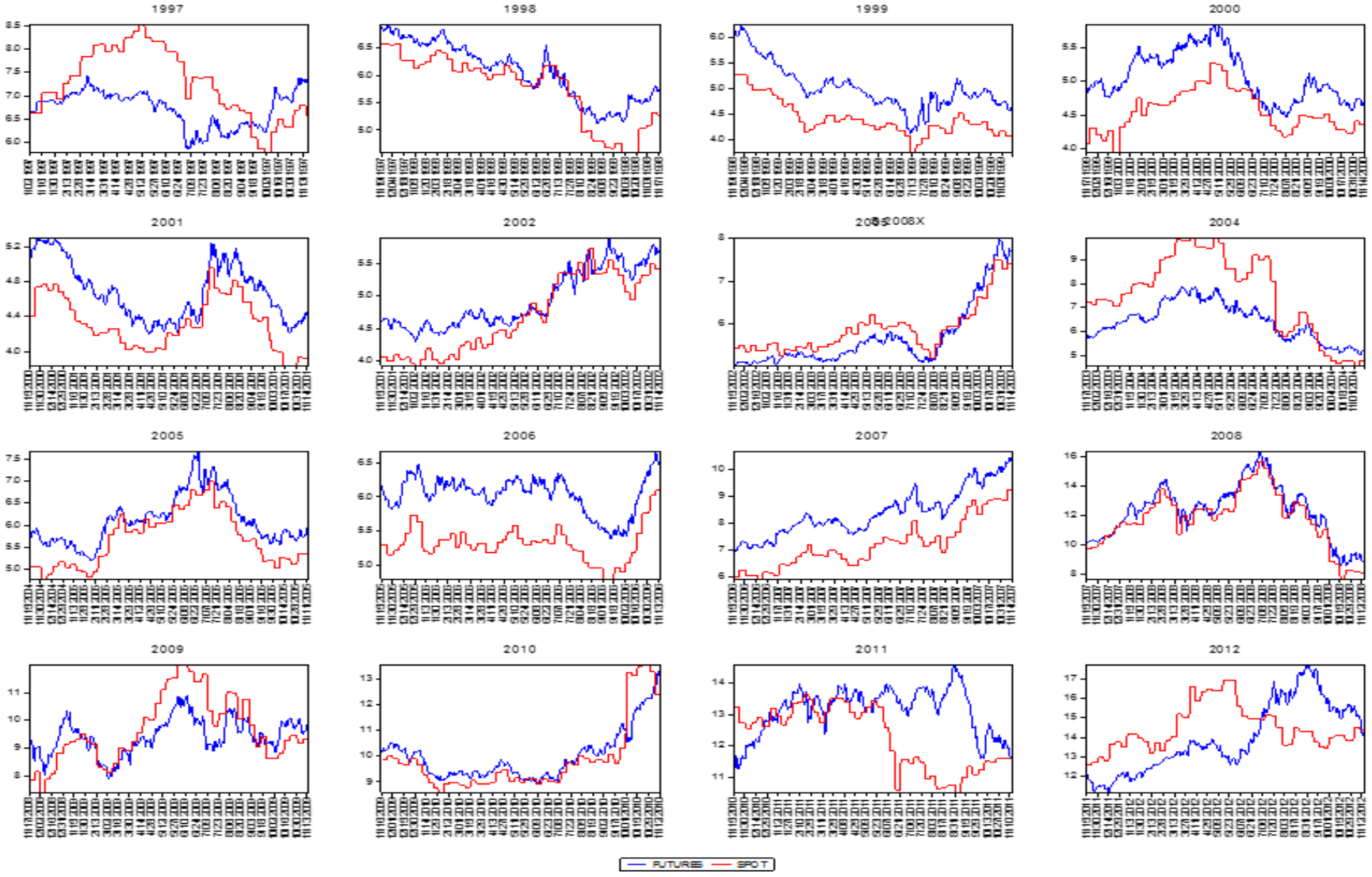


Figure 4: Histograms of November futures prices – 1997 to 2012 (shaded area represents range cash price in Beatrice, NE, in October)

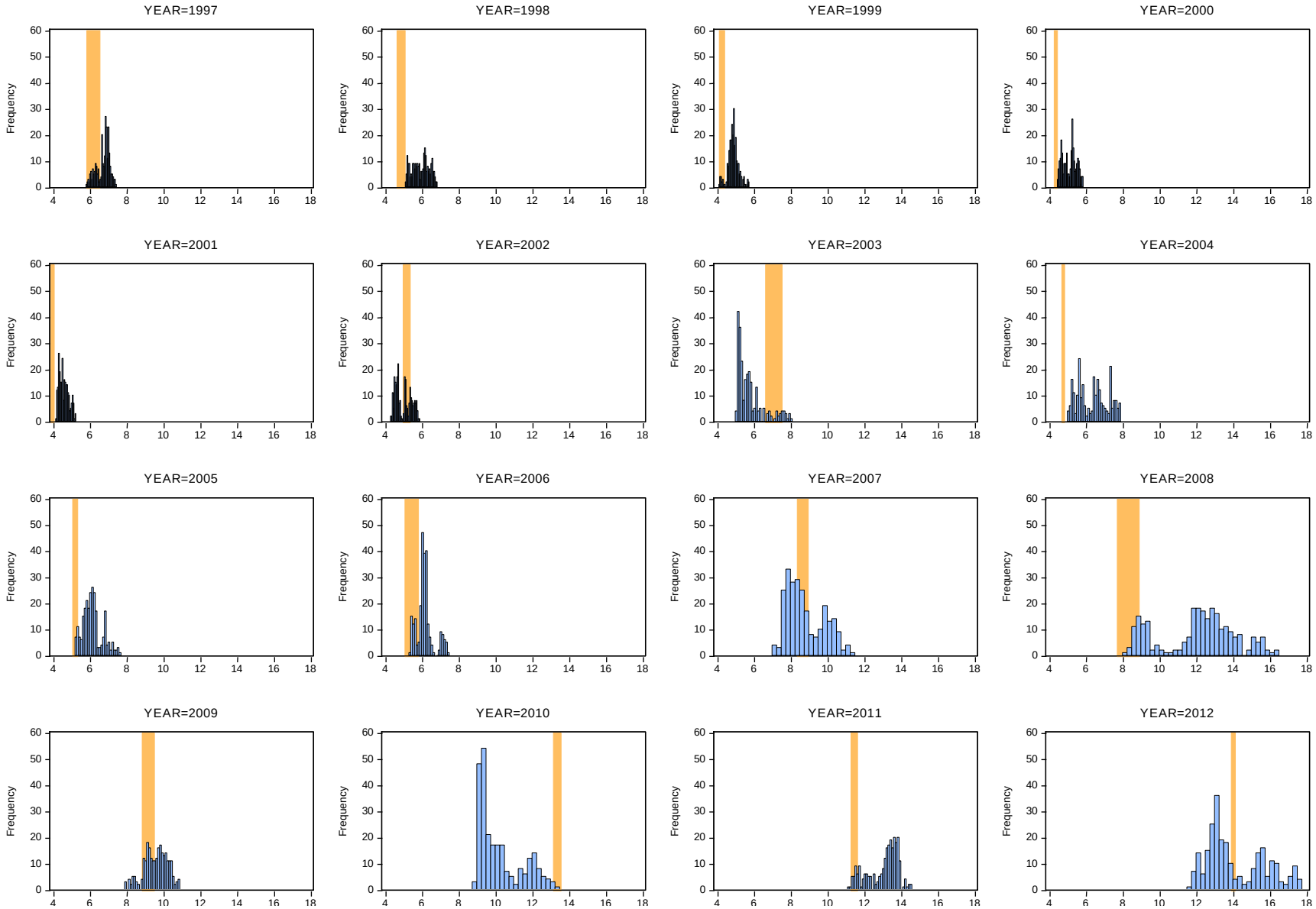
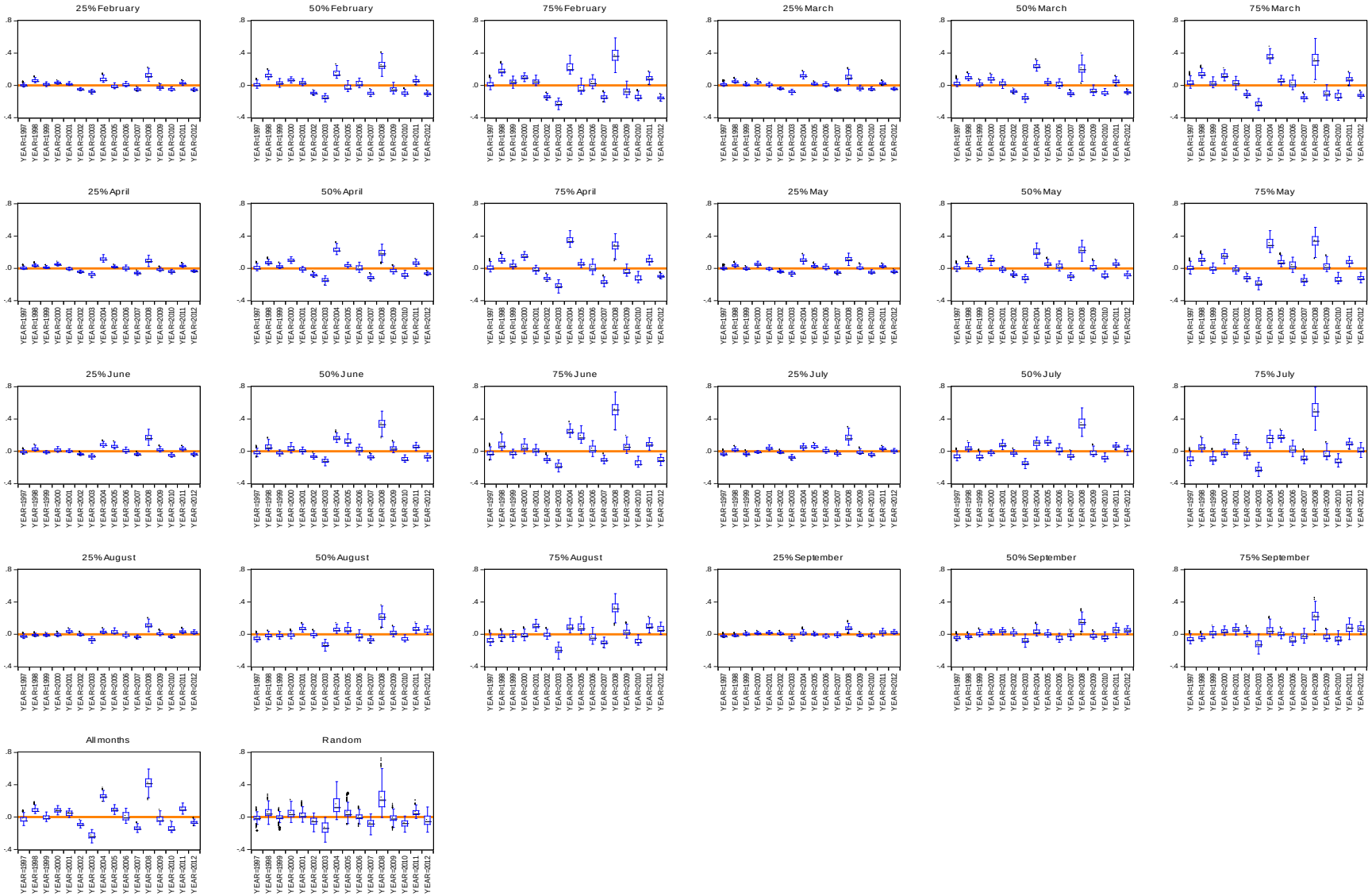


Figure 5: Boxplots of marketing strategies in each year of the 1997–2012 period [a], [b]



(a) titles on top of charts indicate percentage of crop sold with futures contracts and month of futures sale, (b) the horizontal line in the chart represents 0%.