Searching for the Golden Grail: An Optimal Soybean Marketing Frequency Strategy

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Abstract – Gross revenue from marketing frequency strategies varies with average soybean prices across time periods. A study examined statistical differences among trading days using a four-year database of cash prices. Results applied to a hypothetical Arkansas soybean farm using four strategies over four years revealed the optimal gross revenue marketing strategy.

Key Words - Grains, marketing strategies, soybean, cash prices

Objectives – This paper calculates soybean price patterns across individual days of the week and applies the results within a study of marketing frequency. A four-year soybean price database of Arkansas cash market quotes is utilized to identify statistical differences that may exist across the five regular trading days of the week. A hypothetical Arkansas soybean crop with 45,000 bushel annual average production is simulated over four marketing strategies to estimate the optimal gross revenue strategy.

Background – When to sell agricultural commodities to achieve maximum economic gross returns is a question that has persisted for producers over centuries. Lutgen and Helmers (1979) used a financial simulation with five marketing alternatives to study farm income and net worth effects. Mjelde et al. (1985) looked at wheat and corn marketing as affected by the 1982 farm program. Musser et al. (1996) surveyed participants in a Top Farmer Crop Workshop to see how risk and farm characteristics affected pre-harvest marketing techniques of corn and soybean. Tomek and Peterson (2005) used seven strategies incorporating cash, futures, and hedging elements to link commodity price behavior with marketing strategies. Market analysts generally agree that the greatest probability of market seasonal low prices occurs during harvest. A recent study of Arkansas soybean price patterns found that lowest annual prices occur in October and highest annual prices in June (Stark and Bryant 2010). An earlier Arkansas study had found conflicting results with lowest prices in December for a ten-year study and July over the last five years of the same period. Highest prices in the same study occurred in May for the ten-year period and November over the five-year interval (Jordan et al.). A recent national study of soybean price patterns had high and low periods that corresponded to the more recent Arkansas statewide results (Manternach).

Spreading market sales over multiple periods is a strategy used to decrease market pricing risk. The theoretical basis is that increasing the number of marketing sales decreases the likelihood of marketing only on the lowest price days of a period. The downside of this strategy is that the possibility of marketing only on the highest price days is also reduced. Soybean farmers use a wide assortment of marketing frequency strategies. An example would be the Ohio farmer who began selling his 2010 soybean crop in November 2008, had made more than 30 different sales since that beginning as of August 2010, and still had about half of his 2010 projected production uncommitted for sales that would likely extend into 2011 (Stalcup 2010). Some producers extend their strategies beyond cash markets by including futures and options commodity trades.

Data and Methods – Daily soybean cash market and new crop forward price information is collected by the Arkansas Crop and Livestock Reporting Service of Arkansas Agricultural Statistics. The prices are published nationally in Arkansas Daily Grain Report, an online

publication of the Agricultural Marketing Service (USDA). These daily prices for fourteen market locations in the state were used to calculate an average price by specific weekday over a four crop year period. Average daily prices were analyzed using SAS to determine if significant differences existed among the five weekdays. The official USDA soybean crop marketing year runs from September 1 of the crop production year to August 31 of the following year. Forward price quotes are actually available and market sales may be booked beginning on the first calendar day of respective crop year. The marketing period for this study was therefore expanded to include forward booking prices from January 1 of the crop production year to September 30 of the subsequent year. Data in this study covered the 2006 to 2009 crops.

If marketing weekday prices differed significantly, the highest price day would be used to compare gross revenue outcomes from four marketing frequency strategies. The selected strategies considered are selling equal crop proportions over the specified marketing period once per week, per every two weeks, per every four weeks, and once per every eight weeks.

A hypothetical Arkansas soybean crop enterprise was constructed for estimating gross revenue from soybean sales. The enterprise consisted of 1,000 acres averaging 45 bushels of soybean per acre and therefore providing 45,000 bushels per year for marketing. We assume that marketable yield does not vary across the four crop years considered.

Using the hypothetical annual sales quantity, Strategy 1 can be mathematically expressed as:

$$\textbf{Gross Revenue Over 4 Year Period} = \sum_{i=1}^{4} Crop\ Year\ Revenue$$

where: $$Crop\ Year\ Revenue = \sum_{j=1}^{91}((\text{Thursday Price})_j * \left(\frac{45{,}000\ \text{bushels}}{\#\ \text{Sales per Year}}\right)) .$$

The other marketing strategies employed in this study can be expressed in similar form with adjustments for number of sales per year and the prices associated with each of the sales.

Results – Preliminary results using a small set of daily statewide average prices had suggested that Arkansas soybean prices would not differ significantly across the five weekly marketing days. Analysis across the full database using the GLM procedure in the SAS statistical program showed significant differences existed between day, week, and year (Table 1). Means analysis revealed that, across the 2006-2009 crops, Thursday had the highest average market price among the five weekdays, $9.34 per bushel (Table 2). The Thursday price was thus used in the four marketing strategies to calculate total revenue. Some Thursday prices were missing in the data set due to holidays. The Wednesday price immediately prior to the missing price was used as the market price for that week. This adjustment assumes that producers would simply market their usual amount one day early rather than lose one market sale opportunity.

Our hypothesis, based on traditional market theory, was that the strategy of marketing equal amounts each week would generate the highest gross revenue. Calculations of gross revenue across the four year period utilizing each marketing strategy showed “One Sale Per Two Weeks” to generate the highest gross revenue at $1,684,916.80 (Table 3). The marketing strategy of “One Sale Per Week” was slightly lower at $1,681,228.70. Marketing with strategies of “One Sale Per Four Weeks” or “One Sale Per Eight Weeks” had considerably lower gross revenues.

Discussion – Arkansas soybean prices have been shown to have their highest average level on Thursdays of the five regular trading days in each week. Thursday prices were combined over a full soybean market pricing period for each of four crop years to generate gross revenue estimates for a hypothetical Arkansas soybean enterprise. The highest gross revenue values were found for a "One Sale Per Two Weeks" strategy with "One Sale Per Week" a close second. Longer time strategies resulted in reduced gross revenue estimates. The optimal marketing strategy result confirms traditional marketing theory that producers can reduce market price risk by making more frequent sales over longer periods of time. No storage costs were included in this analysis. Including a charge for storage should further strengthen this optimal strategy choice as bushels are moved from storage more quickly under the more frequent sales strategies. Transaction costs were also assumed to be minimal and omitted from this analysis.

Selling an equal amount per week over the months of May, June, and July in the year following each fall harvest period was another marketing strategy that was considered. This M-J-J strategy was suggested based on price levels observed in an earlier Arkansas soybean pricing patterns study (Stark and Bryant). The M-J-J strategy seeks to identify high points in seasonal soybean market price patterns and match sales to those points. Further research on optimal strategies should include this choice among other considerations.

Table 1 GLM Results Across All Years (2006-2009)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	3	4492.842971	1497.614324	42534.10	<.0001 *
week	91	1029.478374	11.312949	321.30	<.0001 *
day	4	0.626793	0.156698	4.45	0.0014 *
year*week	272	3549.549027	13.049813	370.63	<.0001 *
year*day	12	0.227496	0.018958	0.54	0.8904
week*day	359	13.506917	0.037624	1.07	0.2178

* Denotes significant differences at the 0.001 level.

Table 2 Average Soybean Price By Day ($/bushel)

Day	2006	2007	2008	2009	2006-2009
Monday	6.62	10.40	10.80	9.39	**9.30**
Tuesday	6.60	10.35	10.85	9.40	**9.30**
Wednesday	6.60	10.43	10.85	9.40	**9.32**
Thursday	6.62	10.41	10.93	9.41	**9.34**
Friday	6.65	10.38	10.86	9.39	**9.32**
Crop Year Average Price	**6.62**	**10.39**	**10.86**	**9.40**	**9.32**

Table 3 Crop Revenue Across Four Crop Years By Soybean Marketing Strategy

Strategy	# Sales/Crop Year	Bu/Sale	Gross Revenue
1 Sale Per Week	91	495	**1,681,228.70**
1 Sale Per 2Weeks	46	978	**1,684,916.80**
1 Sale Per 4 Weeks	23	1,956	**1,673,407.50**
1 Sale Per 8 Weeks	12 *	3,750 *	**1,662,310.70**
Crop Year Total		**45,000**	

* Note: 2009 crop year had 11 sales of 4,091 bushels each under this strategy.

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