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Flexible Marketing Strategies for Wheat Producers

by

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The financial risk associated with variations in commodity prices is a major concern to agricultural producers. Wheat farmers in the Pacific Northwest have experienced periodic financial losses and gains due to the instability of wheat prices since 1972. The most dramatic fluctuation in wheat prices occurred during the 1973/74 and 1974/75 marketing years when the price of wheat first increased 200 percent, and then, one year later, dropped 50 percent. Wheat price volatility has moderated since 1976, but prices still varied an average of $.66 per bushel annually over the seven-year period from 1976 to 1983.

The price of wheat is important to the grower to the extent that price, along with yields, determines farm income. Over the ten-year period from 1972 to 1982, the net worth of most wheat farmers has been maintained in times of low prices due to off-setting appreciation of land value. But high interest rates in 1981 and 1982 have stopped increases in land values, such that real estate appreciation alone may no longer offset operating losses. In addition, within and between crop years, wheat price fluctuations have created instability in cash flows for the farming enterprise and may disrupt long range management plans and financial commitments.

The ability of producers to grow a crop of wheat seems greater, in many cases, than their ability to satisfactorily sell it. Although producers recognize the importance of the marketing function, they are frustrated by

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their seeming inability to achieve better marketing through their traditional sales decisions.

The purpose of this paper is to describe and illustrate a risk management procedure for application in wheat sales decisions. This is done in two steps. First, the relative performance of various wheat sales alterntives is evaluated in terms of the trade-off between average price received and price variation. Second, a methodology is offered for selecting among these specific sales alternatives based on simple forecasts of future market conditions. Using this procedure, a wheat producer selects from an array of marketing alternatives with known risk and return characteristics, based on a readily-available forecast of market conditions in the marketing period.

The effectiveness of this methodology - referred to here as a "flexible marketing strategy" - is validated over a period of eight marketing years, from 1972 to 1980. In addition, strategy performance is examined for the two subsequent marketing years, 1980/81 and 1981/82.

Measuring the Performance of Marketing Strategies

The procedure adopted to evaluate various marketing plans was to measure how well they would have performed given the price variability in the marketing years 1972/73 through 1979/80. Seventy-three different marketing strategies were identified and evaluated, ranging from the traditional stategies such as sale at harvest or sale of portions of the crop at various intervals in the marketing year, to relatively more sophisticated strategies emphasizing risk management and wheat price outlook (Dickens).

The marketing strategies were simulated with computer modeling in order to specify sales at a given point in time over the marketing year according to the marketing alternative selected. Portland track bids for No. 1 white wheat were used as cash prices in these sales, and Chicago futures prices were selected as a proxy for forward delivery contract prices, because adequate data were lacking for representative Portland forward delivery contracts. Prices received through each strategy were adjusted for storage and interest, but were not adjusted for transportation costs between Portland and farm location.

Eight marketing years for white wheat are represented in the 1972 to 1980 time period. As a result, the variability of price received from a given marketing strategy over this eight year time period was viewed as representative of the price risk associated with that strategy. The average price received from each strategy over each of the eight marketing years was calculated along with its standard deviation or "risk," and both pieces of information used to judge the effectiveness of an individual strategy.

Marketing Strategies

In their marketing decisions, wheat producers have control of two variables. First, they can choose a single or a combination of institutional marketing alternatives, and secondly, they can effect different marketing outcomes by the timing of their sales. The institutional marketing alternatives commonly available to white wheat producers in the Pacific Northwest (Oregon, Washington and Idaho), are cash sales on the spot market, forward contracting (cash or hedging on the

futures market), and participation in government programs. The timing of
the sale together with the various combinations of these alternatives used
is what is referred to herein as marketing strategies.

Cash Market Sales

The cash market sales analyzed include strategies which sell the entire
crop at one time, sell at various times throughout the marketing year, and
which sell according to moving average signals. This latter alternative
serves as a proxy for sales plans designed to hit the top of the market.
Cash sale marketing strategies 1 through 19 are presented in Table 1.
Strategies 1 through 6 sell the entire production in the specified month.
Strategies 7 through 13 sell one-half or one-third of production in the
specified months. Strategies 14 through 19 are "technical" approaches, selling
the entire production on the basis of a "market peak" indicated by moving
average signals.

Forward Contracting Marketing Strategies

Table 2 presents the forward contracting-hedging strategies 20 through
52. Each of the five contract months that the Chicago Board of Trade soft
red winter wheat contract is available is used in the hedging strategies.
Strategies 20 through 24 hedge the entire crop (30,000 bu.) for delivery in
the contract delivery months specified. Strategies 25 and 26 hedge one-
third of the crop (10,000 bu.) in each of the three specified contract
delivery months. Strategies 27 and 28 sell one-third of the crop at
harvest for cash on the spot market, and the remaining two-thirds of the
crop are hedged using the specified futures contracts. Finally, strategies
29 through 52 use alternative combinations of three-, five-, ten-, and

Table 1. Per Bushel Mean and Standard Deviation of Returns for Cash Sale
Alternative White Wheat Marketing Strategies, PNW, 1972-1973
through 1979-1980

No.	Marketing Strategy	Mean	Standard Deviation
		-----dollars-----	
1	August	3.72	1.01
2	October	3.72	1.02
3	December	3.61	0.93
4	March	3.39	0.72
5	May	3.07	0.35
6	July	3.36	0.57
7	1/2 @ August and January	3.65	0.91
8	1/3 @ August, October and December	3.68	0.95
9	1/3 @ August, December and March	3.57	0.84
10	1/3 @ August, March and May	3.39	0.63
11	1/3 @ August, May and July	3.39	0.53
12	1/3 @ December, March and May	3.35	0.62
13	1/3 @ March, May and July	3.28	0.49
14	3-5 week moving average	3.81	0.92
15	3-10 week moving average	3.76	0.80
16	3-15 week moving average	3.71	0.86
17	5-10 week moving average	3.77	0.92
18	5-15 week moving average	3.71	0.87
19	10-15 week moving average	3.69	0.84

Table 2. Per Bushel Mean and Standard Deviation of Returns for Forward
Contracting Alternative White Wheat Marketing Strategies, PNW,
1972-1973 through 1979-1980.

No.	Marketing Strategy	Mean	Standard Deviation
		-----dollars-----	
20	Hedge September	3.49	0.95
21	Hedge December	3.37	0.92
22	Hedge March	3.33	0.89
23	Hedge May	3.19	0.85
24	Hedge July	3.18	0.87
25	Hedge 1/3 @ December, March and May	3.26	0.91
26	Hedge 1/3 @ March, May and July	3.19	0.80
27	Sell cash 1/3 in August; hedge 1/3 @ December and March	3.47	0.90
28	Sell cash 1/3 in August; hedge 1/3 @ March and May	3.41	0.86
29	Hedge December; 3-5 week moving average	3.56	0.96
30	Hedge December; 3-10 week moving average	3.57	0.76
31	Hedge December; 3-15 week moving average	3.58	0.73
32	Hedge December; 5-10 week moving average	3.63	0.78
33	Hedge December; 5-15 week moving average	3.65	0.73
34	Hedge December; 10-15 week moving average	3.64	0.71
35	Hedge March; 3-5 week moving average	3.39	0.87
36	Hedge March; 3-15 week moving average	3.39	0.72
37	Hedge March; 3-15 week moving average	3.39	0.72
38	Hedge March; 5-10 week moving average	3.56	0.88
39	Hedge March; 5-15 week moving average	3.47	0.68
40	Hedge March; 10-15 week moving average	3.45	0.63
41	Hedge May; 3-5 week moving average	3.17	0.67
42	Hedge May; 3-10 week moving average	3.45	0.71
43	Hedge May; 3-15 week moving average	3.18	0.54
44	Hedge May; 5-10 week moving average	3.28	0.71
45	Hedge May; 5-15 week moving average	3.18	0.49
46	Hedge May; 10-15 week moving average	3.08	0.39
47	Hedge July; 3-5 week moving average	3.31	0.89
48	Hedge July; 3-10 week moving average	3.56	0.58
49	Hedge July; 3-15 week moving average	3.26	0.45
50	Hedge July; 5-10 week moving average	3.40	0.57
51	Hedge July; 5-15 week moving average	3.26	0.46
52	Hedge July; 10-15 week moving average	3.21	0.36

fifteen-week moving average Portland white wheat prices as a basis for hedging decisions.

The moving-average hedges are designed to place hedges (sell a futures contract) when moving averages indicate a downward trending market, and the hedges are lifted (buy a futures contract) when the moving averages indicate an upward trending market. Any number of hedges may be placed or lifted depending on how often the moving averages cross. The wheat crop is not sold on the cash market until the specified futures contract matures; consequently, any gains or losses which occur prior to the maturity date are purely speculative. If the moving averages never signal a hedging opportunity, no hedge is placed, and the wheat crop is sold on the cash market when the futures contract matures.

Cash and Forward Contracting Mean-Standard Deviation Analysis

Figure 1 is a mean-standard deviation graph of the returns generated by the cash and forward contracting marketing strategies 1 through 52. As a group, the moving-average speculative strategies 14 through 19 generated the highest mean returns; however, the risk associated with strategies 14 through 19 is relatively high.

The moving-average December hedges, strategies 29 through 34, exhibit the highest mean returns relative to the other moving-average hedging strategies. Strategies 20 through 28, which hedge without any moving average signals, have lower mean returns and higher standard deviations than the December moving-average hedges. Generally, the March moving-average hedges, strategies 35 through 49, have lower means and have standard deviations that are equal to or greater than the December moving-
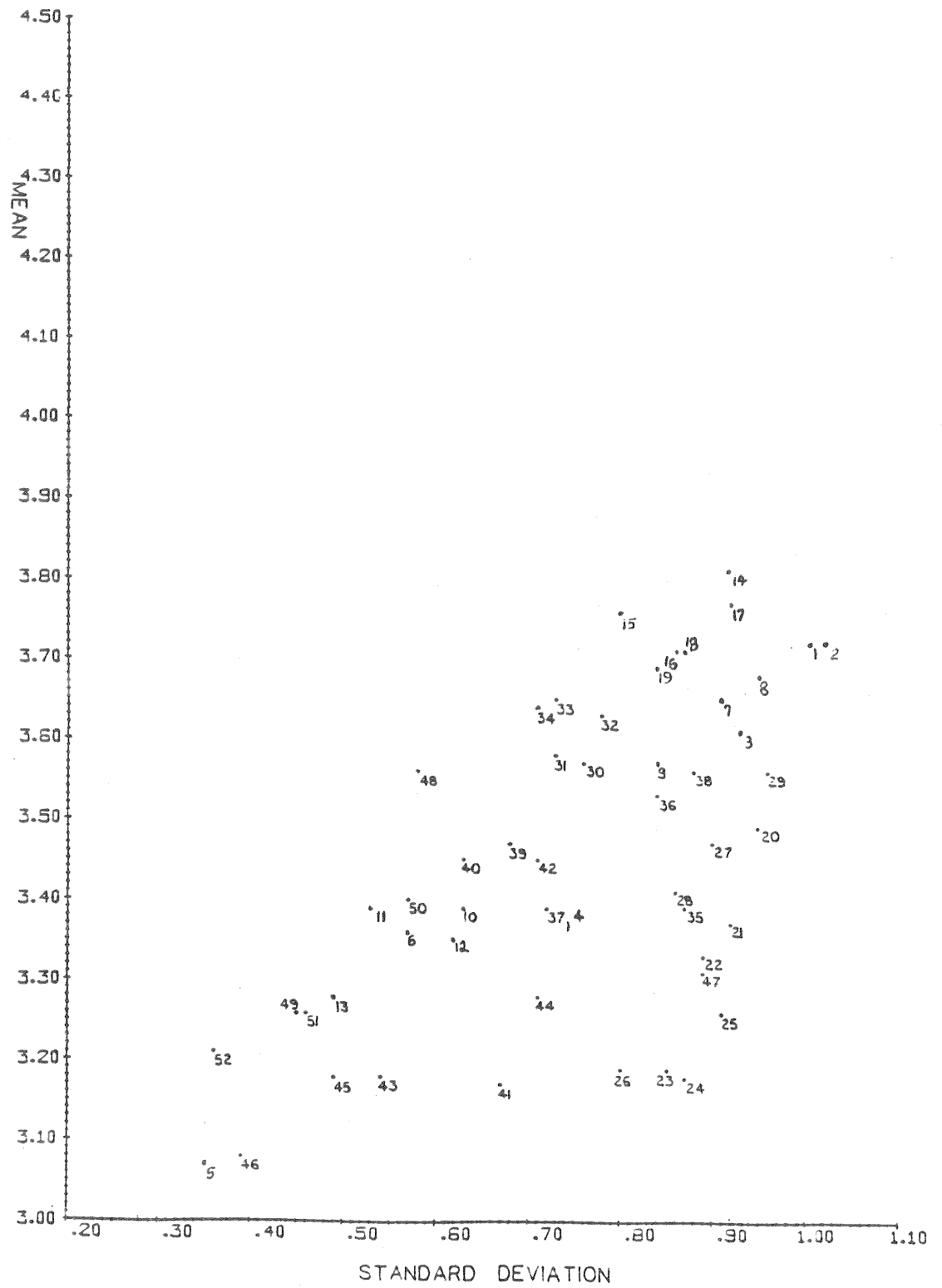
Figure 1. Mean-standard deviation performance of wheat marketing
          strategies.

average hedges. The May and July moving-average hedges tend to have lower means and lower standard deviations than the December moving-average hedges.

Several observations can be made in viewing the performance of the cash sale and forward contracting marketing strategies. First, marketing wheat at harvest during the study period would have performed well in terms of mean returns. For that matter, all of the strategies that sold during the earlier part of the marketing year performed well in terms of mean returns; e.g., cash sale marketing strategies 1, 2, 3, 7, 8, and 9; moving-average cash sale strategies 14 through 19; and December moving-average hedges 29 through 34.

Related to the above, there does not appear to be a consistent return to longer term storage of white wheat as a marketing strategy. There is a pattern of lower mean returns as the wheat is sold later in the marketing year, especially from May through July. Note the difference in mean returns between the early and later crop year cash sales marketing strategies, the early and later crop year fixed hedges, and the early and later crop year moving-average hedges. Participation in the farm program, especially the farm owned reserve, may offset the tendency towards lower mean returns through subsidized interest and storage payments. However, the provisions of the farm program that impact producer marketing decisions were not consistent over the study period, and farm program marketing options are not included in this analysis.

Benchmark Marketing Strategies

Three benchmark strategies - 71, 72, and 73 - were developed for comparison purposes. Assuming perfect hindsight, strategy 71 sells on the highest Thursday cash price that could have been realized in each marketing year. This strategy is an attempt to calculate the value of perfect information. Strategies 72 and 73 spread sales arbitrarily over the marketing year, monthly and weekly, respectively. These two naive strategies model a decision to obtain average prices in conditions of totally uncertain markets. Performance data on these three strategies are listed in Table 3.

Table 3. Per Bushel Mean and Standard Deviation of Returns for Benchmark White Wheat Marketing Strategies, PNW, 1972-1973 through 1979-1980.

No.	Marketing Strategy	Mean	Standard Deviation
		-----dollars-----	
71 Best cash sale		4.43	0.90
72 Cash sale 1/12 each month		3.49	0.70
73 Cash sale 1/52 each week		3.49	0.72

Ranking the Performance of Alternative Strategies

The relative performance of the cash sale and forward contracting marketing strategies suggests that some strategies "dominate" others in a risk-efficient sense.[1] The term dominance evolves from the choice criteria for a risk averse decision maker. A risk averter would choose to maximize mean returns for a given level of risk (standard deviation) and/or

would choose to minimize risk for a given level of mean returns.[2/] The
cash sale strategies which meet this criteria are strategies 5, 11, 15, and
14; these strategies make up the cash sale efficient frontier. Strategies
52, 48, 34, and 33 are the dominant forward contracting strategies; they
make up the forward contracting efficient frontier. This ranking is
illustrated in Figure 2, showing just the risk-efficient frontiers. The
strategies below and to the right of these frontiers (refer to Figure 1)
are dominated. Some are dominated in one dimension, mean or standard
deviation, while others are dominated in both dimensions, mean and standard
deviation.

There is also a definite risk-return tradeoff among the different cash
sale and forward contracting strategies. Examples would be choosing
between strategies 33 and 52, or 14 and 11. These strategies do not
dominate one another. Rather, a choice between them involves a tradeoff
between mean returns and standard deviation. Thus, when a decision maker
chooses among the dominant strategies he must assess his own preferences
for risk and return.

Flexible Marketing Strategies

A significant shortcoming of the collective strategies outlined above
is the implied fixed approach to sales decisions over the 1972-1980 period.
That is, the performance of each strategy presumes that the same sales
decision rules are applied each year; wheat is sold at harvest each year, or
forward contracted according to the same specified rules each year. The
relative ranking of these fifty-two strategies is therefore tied to an
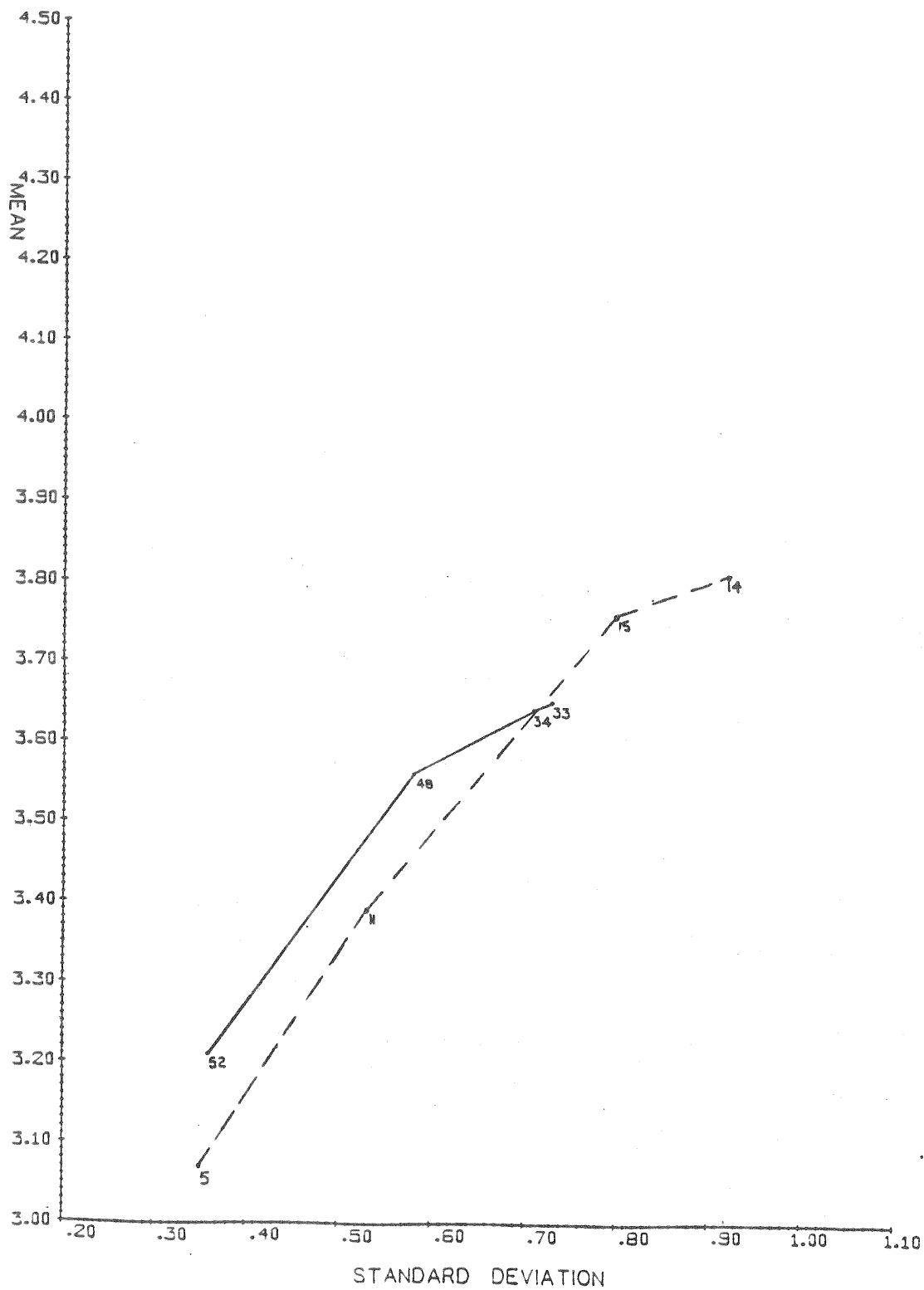arbitrary rule that precludes altering the sales decision rules over time.

Figure 2. Risk-efficient frontier for cash and forward contracting
strategies.

This rigidity of strategy options over time was foreseen at the onset of the research. However, the performance data were generated not to select the "best" sales plan, but to measure the ability of various strategies to combat price risk. Having identified the apparent risk management performance of alternative strategies, it is proposed that a flexible marketing strategy can be prescribed, such that sales decisions are tailored to the market outlook - and associated uncertainty - on an annual basis. This strategy decision is made in May, prior to the beginning of each wheat marketing year.

For example, if the market outlook points to higher trending prices, then higher risk strategies may be more acceptable to the risk-averse decision maker. Conversely, a forecast of a mixed or downtrending market would call for a relatively lower risk strategy. In this manner, the wheat producer adopts a flexible strategy of matching market outlook with an appropriate risk-efficient sales plan; presumably, using higher risk sales options when the risk of price declines is relatively smaller, and vice versa.

Guidelines for Using Flexible Marketing Strategies

The potential for increasing net returns through risk management marketing techniques has been documented in several studies (Baker and Moss, Dewbre, King, Lutgen and Helmers). A continuing challenge is the prescription of appropriate technology at the farm level that will allow for the incorporation of applied risk management methodology.

An approach offered here is to use a relatively naive market forecast that can be generated by the producer/decision maker, and let this forecast serve as the basis for adopting specific marketing alternatives.

Price and demand analyses have shown that basic supply and disappearance statistics prepared and distributed by the USDA are important determinants of future Portland white wheat price levels (Standaert, Dewbre, Heid). These basic statistics include carryover stocks, export sales, total disappearance, and total production. By using these statistics singularly or in ratios to form "pressure indices," inferences may be drawn as to whether or not prices in the future are going to rise or fall from current levels.

Four basic combinations of basic statistics were specified for use in the flexible marketing strategies presented here:

1. carryover stocks as a percent of disappearance in the previous period;

2. carryover stocks as a percent of expected export and carryover;

3. expected exports and carryover as percent of expected supply;

4. the single valued variable, carryover stocks.

Carryover stock is the amount of wheat in storage at the beginning of the market year.[3/] Disappearance during the previous period is the amount of wheat that was used domestically and for exports during the previous marketing year. Expected supply is the sum of beginning stocks and expected production. Expected amount available for export or carryover is the expected domestic use of wheat.

These four market variables (the three ratios and the stocks variable) are evaluated because it is felt they should explain the price effects of

changes in expected wheat supply relative to expected demand. If the relative value of a market variable is high (i.e., a high proportion of stocks relative to demand), prices would be expected to be depressed at harvest. If the variables' relative value is low, prices would be expected to be relatively high at harvest. And, if the variables' relative value is in the middle of its range the expected direction and magnitude of price changes would be uncertain. Thus, the relative values of the four market variables, over the eight marketing years 1972/73 through 1979/80, are used as decision rules to select marketing alternatives that are consistent with expected white wheat prices.

The Decision Rule

Flexible marketing strategies 61 through 70 are presented in Table 4. Their design is a two-stage process. First, the cash and forward contracting strategies 1 through 52 are specified and their results evaluated as to whether they provide a positive return to storage, provide high returns early in the crop year, or whether they provide protection against uncertain price movements. Next, the values of the four market variables are computed over the eight marketing years. The range of values (highest to lowest) was arbitrarily divided into thirds for each market variable. If the value of the market variable is in the top third of its range, indicating large supplies and relatively lower prices, a strategy is adopted that provided a positive return to storage. A strategy is adoped which provided high returns early in the crop year if the market variable is in the bottom third of its range. And, if the value of the market

Table 4. Per Bushel Mean and Standard Deviation for Mixed Alternative
White Wheat Marketing Strategies, PNW, 1972-73 through 1979-1980.

No.	Market Variable and Marketing Strategy(s)[a/]	Mean	Standard Deviation
		-----dollars-----	
61	Stocks (Carryover); PNW white wheat; T:13, B:14, M:1/3 @ (1,14,39)	3.77	0.84
62	Stocks (Carryover); PNW white wheat; T:33, B:14, M:1/3 @ (1,14,39)	3.75	0.96
63	Stocks/Disappearance; U.S. wheat; T:13, B:14, M:1/3 @ (1,14,39)	3.84	0.71
64	Stocks/Disappearance; U.S. wheat; T:33, B:14, M:1/3 @ (1,14,39)	3.75	0.84
65	Stocks/Disappearance; PNW white wheat; T:13, B:14, M:1/3 @ (1,14,39)	3.87	0.84
66	Stocks/Disappearance; PNW white wheat; T:33, B:14, M:1/3 @ (1,14,39)	3.74	0.90
67	Stocks/Expected amount available for export or carryover; PNW white wheat; T:13, B:14, M:1/3 @ (1,14,39)	3.74	0.90
68	Stocks/Expected amount available for export or carryover; PNW white wheat; T:33, B:14, M:1/3 @ (1,14,39)	3.72	1.02
69	Expected amount available for export or carryover/ Expected supply; PNW white wheat; T:13, B:14, M:1/3 @ (1,14,39)	3.52	0.88
70	Expected amount available for export or carryover/ Expected supply; PNW white wheat; T:33, B:14, M:1/3 @ (1,14,39)	3.72	0.93

[a/] T,B, and M indicate which strategy(s) the wheat is sold in if the market variable is in the top, bottom or middle of its range for a given marketing year.

variable is in the middle third of its range, a strategy which provided relatively stable returns over the eight marketing years is adopted.

After an ex post evaluation of the cash and forward contracting strategies 1 through 52, two different marketing scenarios were tested. One scenario, which includes strategies 61, 63, 65, 67, and 69, sells the wheat using strategy 13 (a low risk alternative) if the market variable is in the top third of its range, sells the wheat using strategy 14 (a high risk alternative) if the market variable is in the bottom third of its range, and sells one-third of production in each of the strategies 1, 14, and 39 if the market variable is in the middle third of its range. The second scenario, which includes strategies 62, 63, 66, 68, and 70, is different from the first in only one respect. When the market variable is in the top third of its range, the wheat is sold using strategy 33, representing a slightly higher risk alternative, rather than 13.

The mean-standard deviation performance of the flexible marketing strategies are illustrated in Figure 3, along with the designated risk efficient cash and forward contracting strategies. The flexible marketing strategies performed comparably to the best of the speculative cash sale moving average strategies in terms of mean return, while generally providing lower risk. Strategy 69 ranked relatively below the rest of the flexible plans in terms of mean value, but strategies 63 and 65 generated the highest expected values of all 73 strategies tested, except for the benchmark "perfect hindsight."

Simulated sales decisions for the 1980/81 and 1981/82 marketing years were performed using strategy 65 to further test the decision making procedure. Supply and demand conditions in both years prescribed a
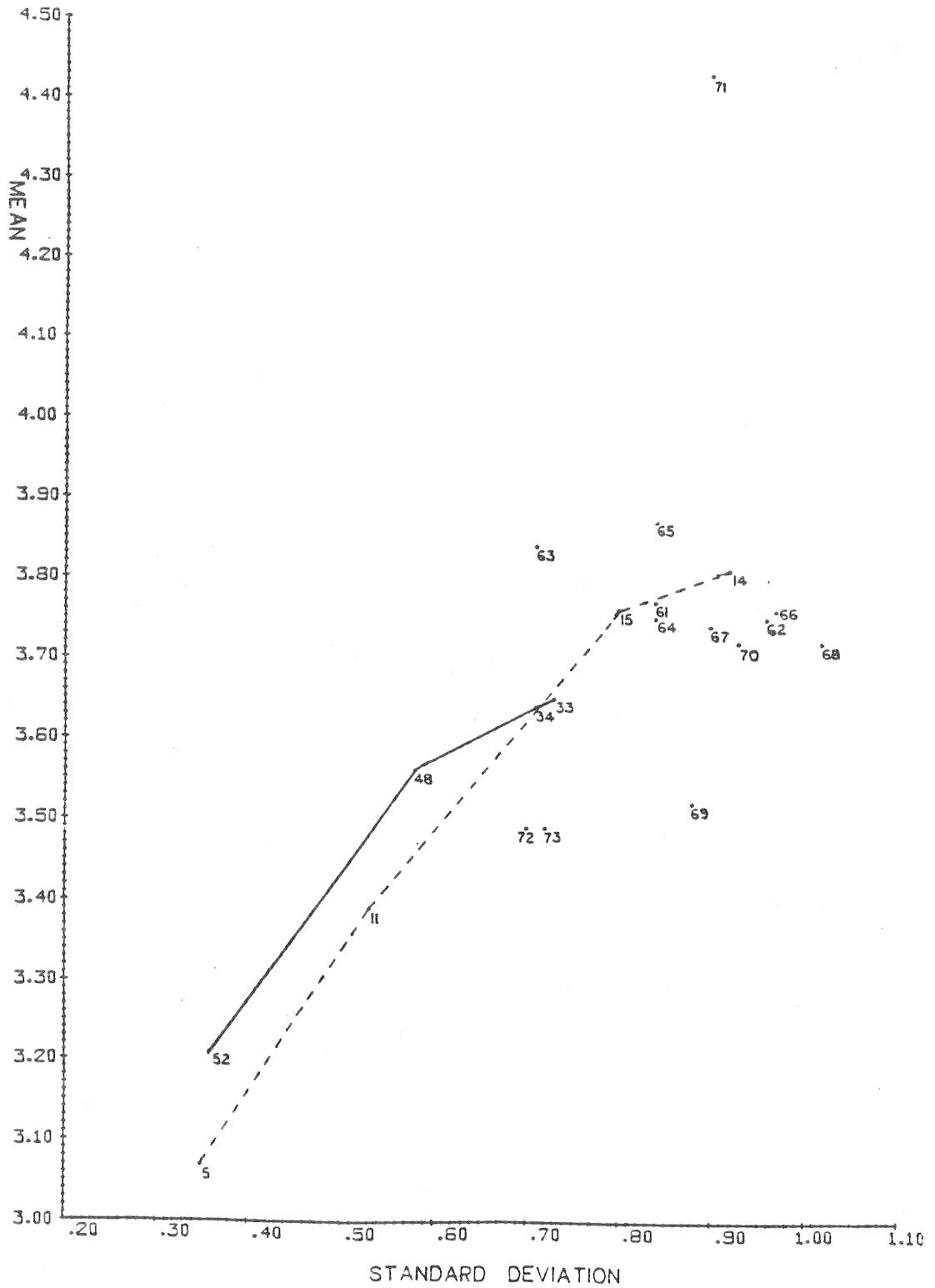
Figure 3. Mean-standard deviation performance of flexible marketing strategies.

"middle-third" market outlook. The appropriate strategy thus called for spreading sales over three marketing alternatives; selling one-third of the production at harvest, one third on speculative, moving average signal, and one third hedged on the futures market for March delivery. The average price obtained using this strategy was $4.22 in 1980/81, and $4.38 in 1981/82, when adjusted for storage and interest costs. At these levels, the prices were $.22 and $.54 higher than the respective 1980/81 and 1981/82 annual average prices, when similarly adjusted for storage and interest.

At the beginning of the 1982/83 marketing year, supply and disappearance variables for white wheat signaled a cautious to pessimistic price outlook. The carryover stocks/disappearance ratio fell between the middle and bottom third range of the distribution of this ratio over the past ten years.

Conclusions

The performance of strategies 61 through 70 suggests that there is potential for using indices of key market variables to improve firm level market performance. The supply and disappearance variables, and resulting strategies used, however, are only a representative sample. No attempt was made in this research to calculate an optimizing flexible strategy.

Developing flexible marketing strategies, as discussed above, calls for little beyond relatively intuitive expectations concerning the risk management properties of specific sales alternatives, and their linkage to simplistic market forecasts.

The findings are encouraging from the perspective that more management-intensive strategies would seem to further improve marketing performance.

That is, more risk-efficient sales options, more frequent market forecasts, finer tailoring of sales options to market forecast, or alternative specification of outlook variables might be expected to further improve upon the results presented here.

FOOTNOTES

[1] Dominance refers mainly to the figurative sense in this case. Statistically, there was no significant difference between some strategies ranked closely together. Moreover, distribution of the variation about the mean is not uniformly normal, further complicating comparisons.

[2] Dickens also developed a set of "Diversified Marketing Strategies" that identified a portfolio of up to five of the most efficient strategies for a specified risk aversion coefficient. The risk efficient frontier of these diversified strategies for eight risk-aversion levels appeared to dominate the single strategy risk-efficient frontier.

[3] The use of carryover stocks as an indicator of market conditions has proven less reliable in the post 1981 period as the proportion of carryover stocks contained in the farmer owned reserve has increased.

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