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## An Evaluation of Alternative Pricing Strategies for Slaughter Hog Producers in Tennessee

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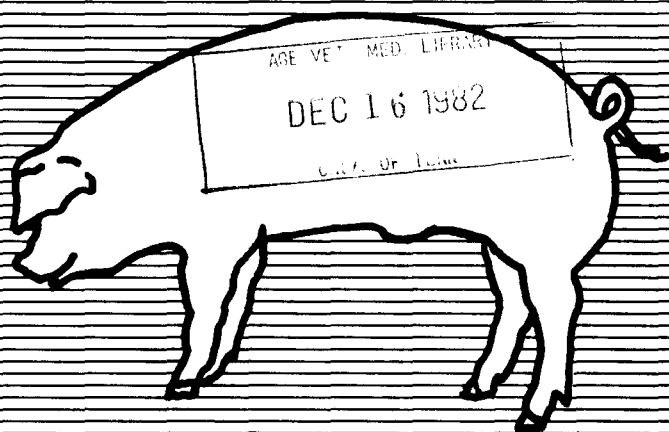
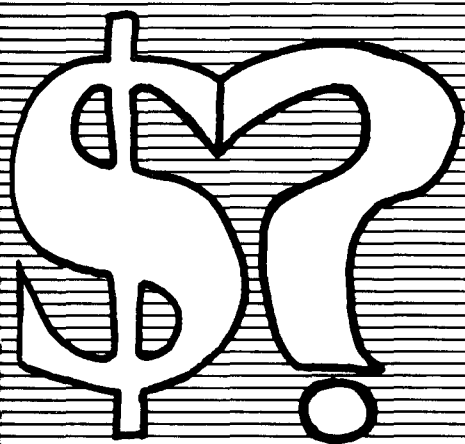
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# AN EVALUATION OF ALTERNATIVE PRICING STRATEGIES FOR SLAUGHTER HOG PRODUCERS IN TENNESSEE

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# AN EVALUATION OF ALTERNATIVE PRICING STRATEGIES FOR SLAUGHTER HOG PRODUCERS IN TENNESSEE

D. L. McLemore, J. R. Adams  
C. B. Sappington, and E. L. Rawls\*

## INTRODUCTION

**O**ne of the major decisions faced by the slaughter hog producer is the choice of a strategy for establishing a price for his product. The traditional approach to marketing or pricing is the simple cash sale where price is established at the time of actual sale or delivery. This method is attractive in that it requires little marketing skill and no prearrangement or contractual obligation. However, in recent years more sophisticated marketing or pricing techniques have gained popularity. These methods usually involve either a cash contract with a buyer that establishes price in advance of delivery or a futures market hedge which makes the final net price dependent upon the futures price at the time of the hedge and upon the basis<sup>1</sup> at the time of actual sale of the hogs. These techniques are attractive because they may allow the producer more flexibility in choosing a favorable price over a period of time and they may provide more certainty or less price risk.

In choosing a pricing strategy, the hog producer is usually assumed to want to achieve a higher average level of profit and, at the same time, to achieve a less variable level of profit over time. Therefore, each pricing strategy is judged by the manager based upon its ability to deliver a higher and more dependable profit.

A substantial body of literature has been developed which explains the alternative pricing methods [2, 3, 7, 9, 17, 18, 20]. However, the Tennessee hog producer still has relatively little evidence on which to base a choice among the alternative pricing methods. The purpose of the research reported here was to evaluate the performance

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<sup>1</sup> The basis is defined as the price for the nearby futures contract minus the local cash price at the same point in time. For additional information on the basis for hogs see McLemore and Adams [13].

of several of the less complicated strategies. More specifically, the objective was to determine which of the alternative pricing strategies would have provided the highest average level of profit<sup>2</sup> and the lowest variability of profit over the recent past in order to draw inferences concerning which strategies might also perform well in the immediate future. The evaluation included operations finishing purchased feeder pigs and farrow-to-finish hog operations.

## STRATEGIES EVALUATED

The alternative pricing strategies or methods included in the study represented the typical cash sale, cash contracting, and futures market hedging. Several variations on both contracting and hedging were included. The typical cash sale, where price is established at the approximate time of actual sale and delivery, was used as a benchmark against which the level and variability of profit from the other strategies were measured. Application of all of the various strategies was totally mechanical in that no judgment was exercised which would alter the rules of the particular strategy. Also, once a hedge or a contract was executed it was never lifted or reconsidered until the hogs were actually marketed.

### Cash Contracting

The cash contracting strategies included a "full-contract" alternative in which all groups of hogs were contracted, at the time the pigs were acquired, for delivery to the buyer at a specific price when ready for slaughter. Variations on the cash contracting method provided for the contracting of hogs only if the contract price was greater than the producer's breakeven price, or greater than the breakeven price plus an increment.<sup>3</sup> This increment was varied from \$3 to \$25 per hundredweight in order to explore its effect on performance of the strategy.

The logic in testing the "contract if contract price exceeds breakeven" strategy is that the producer would lock-in a price only if the price would cover variable cash costs of production. By contracting only if the price exceeded breakeven by some increment, the producer would lock-in a price only if he could cover variable costs and at least a part of fixed cost.

Under the selective contracting criteria, the producer was allowed to test whether the criteria were met from the time the pigs were purchased or farrowed until 6 weeks before the hogs were sold. Groups

<sup>2</sup> Profit, as used in this study, is defined as product price minus variable cost.

<sup>3</sup> The breakeven price consists of the sum of all variable costs of production divided by the weight of the slaughter hog.

of hogs that were not contracted by that time under these selective criteria were marketed as under the typical cash sale. This same procedure was used with the hedging strategies discussed later.

Contract prices were determined by subtracting \$2 from the appropriate futures market price quotation. Various buyers might use other systems for determining contract offer prices and the absolute level might vary some around \$2. However, this approach was considered representative of prevailing practice.

### Futures Market Hedging

The basic futures market hedging strategy considered was the "full-hedge" approach in which all groups of hogs were hedged at the time the pigs were purchased or farrowed. The hedging process consists of selling a live hog futures contract at the beginning of the production period, and then buying an offsetting futures contract at the time the hogs are sold on the cash market. The hedging method of pricing established the price of the product at the time the hedge is made, except for unexcepted conditions in the relationship between cash and futures prices at the time the hogs are actually sold.<sup>4</sup>

**Breakeven Criteria.** Variations on the hedging method consisted of hedging only when certain criteria were met. The breakeven price again provided the starting point for one set of these selective hedging strategies. This group of strategies consisted of the producer placing a hedge only when the localized futures price exceeded the producer's breakeven price, or exceeded breakeven plus an increment. This increment was varied from \$1 to \$27 as with the cash contracting strategies discussed above. The localized futures price represented the current futures price for the appropriate contract minus the basis expected to exist at the time the hogs were actually sold.

**Cash Price Criteria.** A second set of selective hedging strategies placed hedges only when the localized futures price exceeded the cash price, or exceeded the cash price by a fixed increment. As with strategies discussed previously, this increment was set at several different levels (\$1 to \$7). The logic for testing this type of strategy rests upon the idea that the current cash price may be naively viewed as a good estimate of future cash prices. If that is the case, any opportunity to sell hogs at net prices above current cash would be seen as advantageous.

**Moving Averages.** A third, and more sophisticated, group of selective hedging strategies uses the technique of moving averages to determine whether to hedge. The moving average technique consists

<sup>4</sup> This relationship was previously defined as the **basis**. The size of the basis is generally more predictable than cash prices, but it is influenced by many factors such as local market conditions, transportation costs, and seasonal price patterns.

of calculating two moving averages of futures market prices.<sup>5</sup> One of the moving averages is a relatively short-period average (3 to 5 days), while the other is a longer-period average (10 to 15 days). These two averages are updated daily and compared with each other. Since the short-period average is more sensitive to futures price movements, it tends to respond more quickly to price changes than the long-period average. When substantial changes in futures prices occur the short-period crosses the long-period average. The beginning of a substantial upward trend is signaled by the shorter-period crossing the longer-period from below. The shorter will remain above the longer so long as the trend is positive. On the other hand, the beginning of a downward trend is signaled by the shorter crossing the longer from above. So long as the trend is down the shorter will remain below the longer. The length of the period in each average and the relationship between the two lengths will influence the sensitivity of the technique in identifying price changes.

In using the moving average, the producer attempts to hedge on a downward trending market and remain unhedged on an upward trending market. Thus, the ideal hedge is placed when the shorter-period average crosses the longer-period average from above. This should represent a peak price at least for the short term. Of course, there is no assurance that the peak will not be exceeded at some later date.

Three combinations of moving averages were included in this study: 3-day—10-day, 5-day—10 day, and 5-day—15-day.<sup>6</sup> Once a hedge was placed it was not lifted until the hogs were actually sold. As with the other hedging and contracting strategies, the market was tested against the criteria for hedging from the beginning of the production period until 6 weeks before the hogs were to be sold. If a hedge had not been placed by that time, the group of hogs were marketed using the traditional cash sale.

**Delivery Months.** Also included were two selective hedging strategies which hedged only those groups of hogs which were to be sold immediately prior to the delivery period for a futures contract. Months during which live hog futures contracts expire (delivery months) are: February, April, June, July, August, October, and December. Some analysts have found that hedging products to be sold immediately before or during a delivery period is more effective in

<sup>5</sup> A moving average is the simple average of a group of numbers whose members change systematically as time passes. In the case of moving averages of prices, the most recent daily price is taken into the group each day and the oldest daily price is dropped so that the number of prices making up the average remains constant.

<sup>6</sup> More complicated versions of the moving average technique are discussed by Franzmann and Lehenbauer [6].

reducing price variability than hedging products for sale during non-delivery periods [10, 11, 12, 13]. This finding is usually attributed to the tendency for the basis to narrow and become more predictable as the delivery period approaches. This hypothesis was tested by evaluating two strategies consisting of a) hedging only those groups of hogs sold early in delivery months ("delivery months II"), and b) hedging only those hogs sold late in months immediately preceding delivery months as well as those sold early in delivery months ("delivery months I").

**Seasonal Lows.** Seasonal cash price variations are apparent for slaughter hogs [14]. Recurring seasonal low prices for hogs occur from mid-March through mid-June and from mid-October through mid-December. In attempting to escape the effect of these traditionally lower price periods the producer might consider hedging only those hogs that would be sold during those periods [8, 11, 12]. This type of strategy was included in the study in order to assess its performance.

## METHOD OF ANALYSIS

The pricing strategies discussed above were compared by computer simulation of the actual use of the particular strategy in hog production situations. Each strategy was applied mechanically as if it had been the practice of the producer over the entire simulation period. The resulting average profits and variances over the period were then compared.<sup>7</sup> The models developed to represent operations finishing purchased feeder pigs and farrow-to-finish hog operations were based primarily upon budgets contained in the Tennessee Farm Planning Manual [16].

### Finishing Operation

The finishing operation was designed to represent the producer who buys feeder pigs at approximately 45 pounds and feeds them for 4 months. At the end of the production period the hogs should average about 230 pounds each. Since the futures contract requires 30,000 pounds of live hogs, the production unit or group size for feeding was assumed to be 130 head.

Only variable costs were included in the cost calculations. These included the cost of feeder pigs, corn, supplement, veterinary services and medicine, interest, trucking, grinding and mixing, labor, and an allowance for death loss. Fixed costs and management were assumed to receive the residual of returns above variable costs which were considered to constitute the breakeven price.

<sup>7</sup> Additional detail on the methods used in the study may be found in Adams [1].



## Farrow-to-Finish Operation

The farrow-to-finish operation was designed to represent the producer who maintained a breeding herd for pig production and who carried the pigs through the feeding stage to slaughter. The production unit was assumed to consist of 16 sows farrowing at about the same time in order to produce the 130 head of pigs required for one futures contract. The farrow-to-finish process required 6 months. Sows farrowed twice a year and were culled after 2 years.

As with the finishing operation, only variable costs were considered in the profit and breakeven price calculations. Costs were included for corn, interest on capital invested in livestock, other interest, veterinary services and medicine, creep feed, grinding and mixing, pasture, electricity, trucking, labor, boar depreciation, and an allowance for death loss. Income from cull sow sales was also included.

## Time Period

The simulation of the two production operations with the various pricing strategies was conducted using data from the period January 1970 to February 1979. However, the basis estimates necessary for calculating the localized futures price were obtained from a 2-year moving average. That is, the producer was assumed to use the average of the basis for the appropriate period for the most recent 2 years as his estimate of the basis for the period during which the hogs would actually be ready for slaughter. Thus, the data for 1970 and 1971 were used only for basis estimation. The first simulated group of hogs was purchased or farrowed in January 1972.

In order to generate a large number of simulation results the simulated producers were assumed to start one group of hogs on the 5th and 20th of each month. After the first 4 months for the finishing operation and 6 months for the farrow-to-finish operation, one group of hogs was sold on the 5th and 20th of each month.<sup>8</sup> Thus, a total of 162 groups of hogs were simulated for the finishing operation and 160 groups of hogs were simulated for the farrow-to-finish operation. While very few Tennessee hog producers have capacity that large (3,120 head annually), that would not affect the applicability of the results as long as the producer could handle 130 head in a single group.<sup>9</sup>

<sup>8</sup> For marketing strategies involving futures markets, the active futures contract month maturing nearest after the actual selling date of the hogs was used. For hogs marketed on the 20th of delivery months, the next nearest maturing futures was used.

<sup>9</sup> Futures market contracts which require only 15,000 lbs. (65 head) of hogs are available on the Mid-America Commodity Exchange, Chicago.

## Price and Cost Data

Live hog futures price data and Tennessee auction market cash price data constituted the major groups of information needed for the simulation. These two data sets were obtained for the 1970-79 period from Chicago Mercantile Exchange Yearbooks [4] and from Federal-State Market News Service sources [5], respectively. The cash price data were for grades and weights as closely comparable as possible to the futures contract delivery grades and weights. The daily closing futures price was considered appropriate to represent the futures market, while the average of 15 representative auction markets geographically dispersed across Tennessee was considered descriptive of the local cash market.

Prices for feeder pigs, corn, supplement, and sows were obtained on a monthly basis from Tennessee Agricultural Statistics [19]. Interest rates reflected the net cost of money from Production Credit Associations as reported in USDA's Agricultural Statistics [21]. The remaining costs were obtained from budgets in various issues of the Tennessee Farm Planning Manual [16].

Basis estimates were developed from the futures and cash price data for 10-day periods over the 10 years. Breakeven prices by individual month were developed from the budgets and the input prices for each of the two enterprises for the period analyzed.

For those marketing strategies which involved futures market trades, a commission charge of \$50 was assessed for each contract. In addition, an initial margin money interest charge of \$25 for the finish operation and \$37.50 for the farrow-to-finish operation was added to costs when futures market hedges were made.<sup>10</sup>

## RESULTS

Evaluation of the various strategies consisted of comparing their relative performance in meeting the producer's assumed preference for both higher and more stable profits. However, these two goals are in many cases inconsistent. Higher profitability may be associated with less stability. If both goals are not achievable concurrently, then the producer must choose which goal is more important, or how much stability he is willing to sacrifice in order to obtain higher profit. This choice depends upon many financial and personal factors and must be made by each individual producer. No general recommendation can be made. Thus, this analysis will identify those strategies which appeared to be superior in either average profit or stability of profit.

<sup>10</sup> No interest allowance was made for margin money which might be required in addition to the initial margin or which might be deducted from the initial margin deposit, since its expected value is zero.

## Finishing Operation

The mean and variance of profit and the number of times a strategy other than the typical cash sale was used are shown in Table 1 for each of the 32 pricing strategies tested with the finishing operation. The number of non-full-cash marketings indicates the selectivity of a given strategy. The non-selective strategies (full-cash, full-hedge, and full-contract) show either 0 or 162 non-full-cash marketings. Between those extremes the more selective strategies show fewer executions of hedges or contracts and more full-cash sales.

Figure 1 shows a plot of the mean and variance values for each strategy. The numbers refer to the specific strategies shown in the key and the symbols classify the type of strategy. The more desirable strategies on the figure are those which are lowest and furthest to the right. Full-Cash (#1) was used as a point of comparison.

All of the strategies shown had a smaller variance than full-cash. That is, they are below number 1 on Figure 1. Some of the strategies also had a higher mean profit (those to the right of the full-cash reference line). Therefore, according to the assumed criteria, those that met both conditions (both below and to the right of #1) were superior to full-cash over the 1972-79 period.

No conclusive judgment can be made concerning those strategies inside the "box." They had a smaller variance but a smaller mean profit than full-cash.

However, certain strategies both inside and outside the "box" in Figure 1 can be shown to be superior to most of the others. In general, if a plotted strategy had any strategy both below it and to its right, then it was not potentially an optimum strategy. If a strategy had no other strategy below it and to its right, it was potentially optimum. This means that numbers 23, 16, 24, 25, 26, 18, 19, 27, and 28 made up the set of potentially best strategies. The choice among those would depend upon an individual producer's preferences for higher profits as opposed to more stable profits. If the producer wished to further limit his choices to those strategies that gave mean profits higher than full-cash, only numbers 26, 18, 19, 27, and 28 would be considered.

The pricing strategies identified as potentially optimum consisted of a) cash contracting strategies which contracted if contract price exceeded breakeven plus \$3 to \$10, and b) hedging strategies which hedged if localized futures exceeded breakeven plus \$5, \$9, or \$10. Full-hedge (#2), full-contract (#22), moving average hedging (#30-32),<sup>11</sup> delivery months hedging (#3-4), and seasonal low

<sup>11</sup> Moving average hedging strategies have been shown to work well with other commodities when the analysis allowed the producer to hedge and then lift the hedge and, perhaps, hedge again before the commodity was actually sold [6, 15].

**Table 1. Mean and variance of profitability, maximum and minimum profit levels, and number of non-full-cash marketings for simulated hog finishing operations using specified pricing strategies, Tennessee, 1972-1979**

Pricing strategy	Mean per 130 hd.	Variance	Maximum	Minimum	Number of non-full-cash marketings
	Dollars				
Full-cash	1843.27	3531494.00	7758.66	-3564.60	0
Full-Hedge	894.11	1220179.00	4431.00	-1823.25	162
Delivery Months I	1255.31	2277410.00	6798.66	-2359.02	95
Delivery Months II	1541.60	2997597.00	6798.66	-2652.54	48
Seasonal Lows	1472.10	2979186.00	7758.66	-2229.60	67
Localized Futures Greater Than Cash	1323.13	1910340.00	6126.78	-2359.02	121
Localized Futures Greater Than Cash + \$1	1509.75	2212442.00	6733.11	-2359.02	104
Localized Futures Greater Than Cash + \$3	1948.73	2396422.00	7758.66	-2359.02	81
Localized Futures Greater Than Cash + \$4	1951.47	2459846.00	7758.66	-2359.02	71
Localized Futures Greater Than Cash + \$5	2064.25	2788768.00	7758.66	-2359.02	58
Localized Futures Greater Than Cash + \$6	1990.20	3294107.00	7758.66	-2359.02	39
Localized Futures Greater Than Breakeven	988.39	1003036.00	4431.00	-1914.30	158
Localized Futures Greater Than Breakeven + \$1	1011.87	1056028.00	4431.00	-2274.30	150
Localized Futures Greater Than Breakeven + \$2	1091.94	946360.00	4431.00	-2274.30	146
Localized Futures Greater Than Breakeven + \$3	1190.53	954617.00	4431.00	-2359.02	143
Localized Futures Greater Than Breakeven + \$5	1510.77	944394.00	4431.00	-2359.02	120
Localized Futures Greater Than Breakeven + \$7	1751.51	1306239.00	4431.00	-2359.02	100
Localized Futures Greater Than Breakeven + \$9	1942.16	2006836.00	5548.49	-3564.60	82
Localized Futures Greater Than Breakeven + \$10	2059.51	2441417.00	7758.66	-3564.60	69
Localized Futures Greater Than Breakeven + \$11	2056.46	2807618.00	7758.66	-3564.60	48
Localized Futures Greater Than Breakeven + \$12	1996.59	3503709.00	7758.66	-3564.60	30
Full-Contract	516.07	1188839.00	3726.00	-1899.72	162
Contract Price Greater Than Breakeven + \$3	1176.25	652952.00	3726.00	-2359.02	128
Contract Price Greater Than Breakeven + \$6	1683.82	1036752.00	4377.21	-2359.02	92
Contract Price Greater Than Breakeven + \$7	1793.45	1128455.00	4377.21	-2359.02	89
Contract Price Greater Than Breakeven + \$8	1876.62	1714659.00	5131.08	-3564.60	80
Contract Price Greater Than Breakeven + \$9	2093.73	2755622.00	7758.66	-3564.60	56
Contract Price Greater Than Breakeven + \$10	2143.38	2940632.00	7758.66	-3584.60	42
Contract Price Greater Than Breakeven + \$11	2031.38	3358562.00	7758.66	-3564.60	29
3-10-Day Moving Average	1074.40	1666468.00	5349.33	-2243.34	161
5-10-Day Moving Average	1065.98	1623739.00	5154.33	-2693.34	161
5-15-Day Moving Average	1134.49	2108951.00	7758.66	-2138.25	155

## Legend

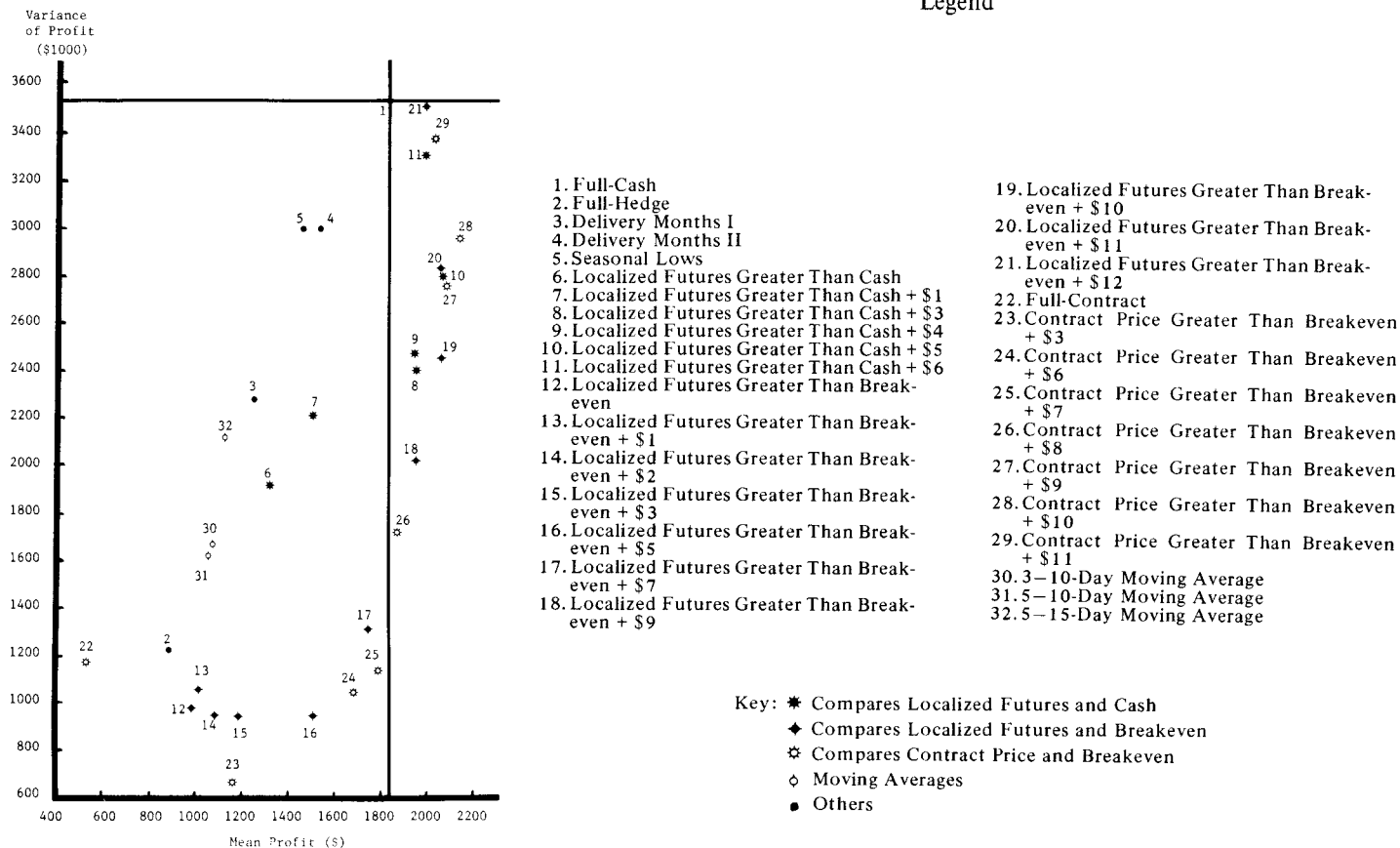


Figure 1. Mean and variance of profitability for simulated hog finishing operations using specified pricing strategies, Tennessee, 1972-1979

hedging (#5) performed rather poorly compared to the other strategies. Full-hedge and full-contract, while providing small variance, showed especially low mean profits.

### Farrow-to-Finish Operation

Results of the analysis of the 39 strategies tested for the farrow-to-finish producer are shown in Table 2 and Figure 2. The full-cash (#1) strategy was again used as a point of reference. Those strategies below and to the right of full-cash had lower variances and higher means and were judged superior to full-cash. On the other hand, number 5 which is above and to the left of full-cash was inferior to full-cash. No conclusive judgment can be made about those strategies below and to the left of full-cash and those above and to the right of full-cash. They may or may not have been more desirable than full-cash depending upon a producer's preferences.

However, given the assumed criteria, a set of best strategies can be selected as was done for the finishing operation. Those strategies which had no other strategy both below them and to their right are numbers 29, 30, 18, 31, 20, 9, 10, and 25. Other strategies such as numbers 11 and 36 were very close to meeting this condition. Number 25 (hedge if localized futures exceeded breakeven plus \$27) showed the highest average profit, but also the highest variance. On the other hand, number 29 (contract if contract price exceeded breakeven plus \$12) showed the lowest variance of any strategy tested, but its mean profit was well below many of the others. If the producer wished to limit his choices from the set of best strategies to those that produce a lower variance and a higher mean than full-cash, only numbers 20, 9, and 10 would be considered.

The pricing strategies identified as belonging to the set of best strategies consisted of three different types: a) cash contracting strategies which contracted if contract price exceeded breakeven plus \$12, \$15, and \$18, b) hedging strategies which hedged if localized futures exceeded breakeven plus \$15, \$21, and \$27, and c) hedging strategies which hedged if localized futures exceeded cash plus \$4 and \$5. The choice among these eight best strategies again depends upon the individual producer's preferences.

Full-hedge (#2) and full-contract (#26) strategies again performed rather poorly showing smaller variances than full-cash, but also showing substantially smaller mean profits. Also, the moving average (#37-39) and delivery months (#3 and 4) hedging strategies were inferior to many of the others.

### Extrapolation of Results

Using past conditions to predict the future is always precarious.

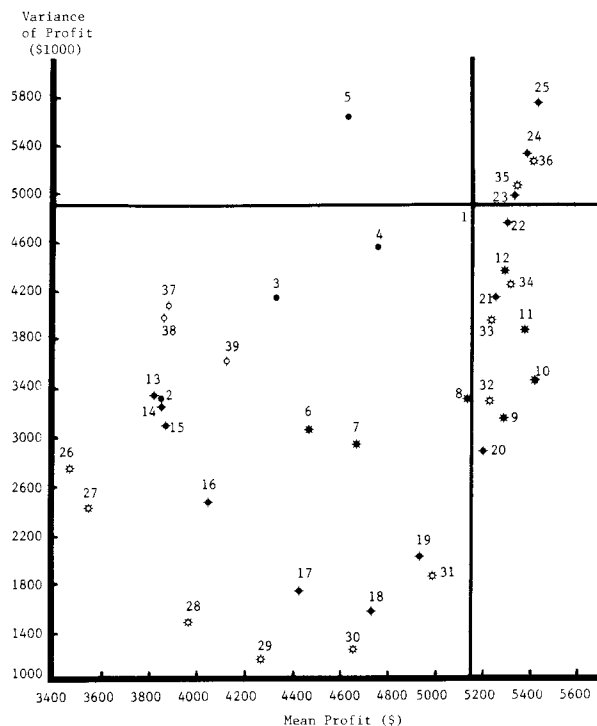
**Table 2. Mean and variance of profitability, maximum and minimum profit levels, and number of non-full-cash marketings for simulated farrow-to-finish hog operations using specified pricing strategies, Tennessee, 1972-1979**

Pricing strategy	Mean per 130 hd.	Variance	Maximum	Minimum	Number of non-full-cash marketings
	-----Dollars-----				
Full-Cash	5153.24	4882723.00	11382.51	-215.49	0
Full-Hedge	3839.75	3323610.00	9436.24	-461.30	158
Delivery Months I	4341.09	4146021.00	10422.51	-111.86	92
Delivery Months II	4746.53	4568681.00	11125.14	-26.09	47
Seasonal Lows	4633.32	5604368.00	11382.51	-461.30	63
Localized Futures Greater Than Cash	4477.28	3032452.00	8504.59	-491.09	124
Localized Futures Greater Than Cash + \$1	4665.88	2941342.00	8444.59	734.14	110
Localized Futures Greater Than Cash + \$3	5150.83	3280913.00	11382.51	1869.81	90
Localized Futures Greater Than Cash + \$4	5248.32	3093295.00	11382.51	1869.81	81
Localized Futures Greater Than Cash + \$5	5406.12	3449355.00	11382.51	1869.81	69
Localized Futures Greater Than Cash + \$6	5370.36	3859700.00	11382.51	1212.03	54
Localized Futures Greater Than Cash + \$7	5287.07	4389097.00	11382.51	-215.49	34
Localized Futures Greater Than Breakeven	3838.89	3323610.00	9436.24	-461.30	158
Localized Futures Greater Than Breakeven + \$1	3849.18	3254208.00	9436.24	-461.30	158
Localized Futures Greater Than Breakeven + \$3	3873.58	3101322.00	9436.24	-461.30	158
Localized Futures Greater Than Breakeven + \$9	4046.78	2461316.00	9436.24	918.70	153
Localized Futures Greater Than Breakeven + \$12	4415.94	1736358.00	9436.24	1869.81	138
Localized Futures Greater Than Breakeven + \$15	4741.33	1589761.00	9436.24	1869.81	118
Localized Futures Greater Than Breakeven + \$18	4943.27	2014247.00	9436.24	1869.81	97
Localized Futures Greater Than Breakeven + \$21	5202.31	2863575.00	9436.24	1869.81	69
Localized Futures Greater Than Breakeven + \$23	5259.40	4168045.00	11382.51	-215.49	58
Localized Futures Greater Than Breakeven + \$24	5303.02	4734297.00	11382.51	-215.49	52
Localized Futures Greater Than Breakeven + \$25	5330.90	4987149.00	11382.51	-215.49	48
Localized Futures Greater Than Breakeven + \$26	5394.54	5281757.00	11382.51	-215.49	43
Localized Futures Greater Than Breakeven + \$27	5425.14	5740131.00	11382.51	-215.49	30
Full-Contract	3463.31	2748672.00	8354.22	55.41	158
Contract Price Greater Than Breakeven + \$5	3540.95	2404444.00	8354.22	1287.60	157
Contract Price Greater Than Breakeven + \$10	3966.95	1484681.00	8354.22	1869.81	140

**Table 2. Mean and variance of profitability, maximum and minimum profit levels, and number of non-full-cash marketings for simulated farrow-to-finish hog operations using specified pricing strategies, Tennessee, 1972-1979 (continued)**

Pricing strategy	Mean per 130 hd.	Variance	Maximum	Minimum	Number of non-full-cash marketings
-----Dollars-----					
Contract Price Greater Than Breakeven + \$12	4276.00	1186422.00	8354.22	1869.81	127
Contract Price Greater Than Breakeven + \$15	4657.54	1246496.00	8354.22	1869.81	106
Contract Price Greater Than Breakeven + \$18	4988.12	1865701.00	8385.39	1869.81	86
Contract Price Greater Than Breakeven + \$21	5212.67	3279637.00	11382.51	1869.81	63
Contract Price Greater Than Breakeven + \$22	5221.12	3959054.00	11382.51	-215.49	52
Contract Price Greater Than Breakeven + \$23	5303.90	4247362.00	11382.51	-215.49	46
Contract Price Greater Than Breakeven + \$24	5341.38	5021510.00	11382.51	-215.49	39
Contract Price Greater Than Breakeven + \$25	5397.00	5279264.00	11382.51	-215.49	35
3—10-Day Moving Average	3882.07	4067191.00	9862.24	-1804.91	158
5—10-Day Moving Average	3872.71	3985835.00	9862.24	-1804.91	158
5—15-Day Moving Average	4128.52	3621840.00	10114.75	-641.30	158





### Legend

1. Full-Cash
2. Full-Hedge
3. Delivery Months I
4. Delivery Months II
5. Seasonal Lows
6. Localized Futures Greater Than Cash
7. Localized Futures Greater Than Cash + \$1
8. Localized Futures Greater Than Cash + \$3
9. Localized Futures Greater Than Cash + \$4
10. Localized Futures Greater Than Cash + \$5
11. Localized Futures Greater Than Cash + \$6
12. Localized Futures Greater Than Cash + \$7
13. Localized Futures Greater Than Breakeven
14. Localized Futures Greater Than Breakeven + \$1
15. Localized Futures Greater Than Breakeven + \$3
16. Localized Futures Greater Than Breakeven + \$9
17. Localized Futures Greater Than Breakeven + \$12
18. Localized Futures Greater Than Breakeven + \$15
19. Localized Futures Greater Than Breakeven + \$18
20. Localized Futures Greater Than Breakeven + \$21
21. Localized Futures Greater Than Breakeven + \$23
22. Localized Futures Greater Than Breakeven + \$24
23. Localized Futures Greater Than Breakeven + \$25
24. Localized Futures Greater Than Breakeven + \$26
25. Localized Futures Greater Than Breakeven + \$27
26. Full-Contract
27. Contract Price Greater Than Breakeven + \$5
28. Contract Price Greater Than Breakeven + \$10
29. Contract Price Greater Than Breakeven + \$12
30. Contract Price Greater Than Breakeven + \$15
31. Contract Price Greater Than Breakeven + \$18
32. Contract Price Greater Than Breakeven + \$21
33. Contract Price Greater Than Breakeven + \$22
34. Contract Price Greater Than Breakeven + \$23
35. Contract Price Greater Than Breakeven + \$24
36. Contract Price Greater Than Breakeven + \$25
37. 3-10-Day Moving Average
38. 5-10-Day Moving Average
39. 5-15-Day Moving Average

Key: \* Compares Localized Futures and Cash  
 ◆ Compares Localized Futures and Breakeven  
 ✱ Compares Contract Price and Breakeven  
 ◊ Moving Averages  
 • Others

Figure 2. Mean and variance for simulated farrow-to-finish hog operations using specified pricing strategies, Tennessee, 1972-1979

However, in the absence of better information, predictions based on an analysis of the past can be very useful. Since the purpose of this research was to evaluate past performance of pricing strategies in order to draw inferences about their future performance, some assessment needed to be made of the stability or dependability of the results. This assessment was accomplished by dividing the period of analysis (1972-79) into two separate parts and performing the same analysis for each half of the period separately. Simulations for 1972-75 and for 1976-79 separately indicated that the same strategies provided superior performance in both periods. This indicated that the results of the analysis for the entire 1972-79 period were reasonably stable during the period. Therefore, there is no evidence that the relative performance of the pricing strategies was changing over time. We can feel reasonably comfortable in applying the results to immediate future situations.<sup>12</sup>

## CONCLUSIONS AND IMPLICATIONS

**T**he results of this study indicate that there were several pricing strategies which could have been used by hog finishing and farrow-to-finish hog producers in Tennessee over the 1972-79 period which would have provided both a higher average level of profit and lower variability of profit than the typical cash sale practice used by most hog producers.

The pricing strategies which out-performed the full-cash strategy consisted of techniques using either cash contracting or futures market hedging. However, the practices of consistently cash contracting or consistently hedging all hogs at the beginning of the production period gave relatively poor performance and are not advisable. The full-contract and full-hedge strategies were able to reduce the variability of profit substantially compared to full-cash, but they gave relatively low average profits.

While the producer's choice from among the alternative strategies must be based upon his own set of preferences, several strategies can be identified which belong to the set of potentially best strategies and which also produced both higher average profits and lower variability of profits than full-cash. For the hog finishing operation the five strategies that met these conditions were:

- 1 — Contract if contract price exceeds breakeven plus \$8.
- 2 — Contract if contract price exceeds breakeven plus \$9.
- 3 — Contract if contract price exceeds breakeven plus \$10.

<sup>12</sup> Since inflation may continue to cause changes in the value of money, the absolute size of the dollar increments above breakeven or cash prices used in the strategies in this study may become insignificant as time passes. That is, the optimum increments may grow larger over time.

- 4 — Hedge if localized futures price exceeds breakeven plus \$9.
  - 5 — Hedge if localized futures price exceeds breakeven plus \$10.
- For the farrow-to-finish operation three strategies met the conditions:
- 1 — Hedge if localized futures price exceeds breakeven plus \$21.
  - 2 — Hedge if localized futures price exceeds cash plus \$4.
  - 3 — Hedge if localized futures price exceeds cash plus \$5.

Since most of the strategies listed depend upon determination of a breakeven price, the calculation of that price is important. In this study only variable costs were considered as a part of the breakeven price. Other strategies depend upon the calculation of a localized futures price which consists of the futures price minus the basis expected to exist at the time the hogs are actually marketed.

Other types of strategies evaluated gave poorer results. Three moving average hedging strategies tested for each type of operation did not perform well. The same was true of delivery months and seasonal low hedging strategies.

While using past performance of pricing strategies as an indicator of future performance is somewhat risky, an analysis of the more recent half of the data compared to the older half revealed that the same strategies were superior in both periods. This implies that the results of this study may be reasonably good indicators of which pricing strategies may be superior in the future.

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