A RE-EXAMINATION OF THE SYSTEMATIC DOWNWARD BIAS IN LIVE CATTLE FUTURES PRICES

by

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Helmuth (1981) introduced a trading technique in this journal that predicted certain drops in live cattle futures prices with 100 percent accuracy.[1] The technique involved selling live cattle futures when the price equaled or exceeded the Corn Belt cattle feeders' costs plus an Iowa-Southern Minnesota basis adjustment.[2] Over the period January 1978 through January 1981, the futures price exceeded the breakeven price plus basis adjustment 29 times, and in all 29 occurrences the futures price subsequently dropped below the selling price. The average drop in price per occurrence was $0.90 per hundredweight (cwt.) or $360 per 40,000 pound futures contract.[3] Helmuth concluded from his study that pricing was inefficient in the live cattle futures market. He based his conclusion on the fact that in an efficient market price changes are random, and thus it should not be possible to discover a trading technique that can predict future price changes with 100 percent accuracy.

Pluhar, Shafer, and Sporleder--PSS--(1985) retested Helmuth's trading technique (HTT) for the period July 1974 through December 1982 and found that the HTT produced positive gross profits. Compared to the results from Helmuth's study period, the mean gross profit per trade ($96.37 per contract) was not as large nor was it significantly different from zero. The losing trades during 1974-82 all occurred in the April contract when a position was taken after 90 days from the first day of the placement month (October or November). When trading was restricted in the April

contract after 90 days, all the losing trades were eliminated and the mean gross profit per trade increased to $224.27 per contract, which was significantly greater than zero.

This research re-examined the HTT using seven years of data (1983-89) beyond the PSS study period. The objective was to determine whether pricing inefficiency (from the predictable price drops) has continued in the live cattle futures market. Helmuth believed that disclosure of his trading technique would eliminate the downward bias in the market, and would destroy the ability of large cattle traders to reap unjustified profits at the expense of Corn Belt cattle feeders (Smith, 1981, p. 3).[4] PSS examined the HTT using two years of data beyond the Helmuth study period, and found that it was profitable, although the mean profit was less than during the original Helmuth study period. Both the Helmuth and PSS results are within sample (ex post) tests because the trading rules were not specified before the beginning of the simulation period. The seven years of additional data used in this study will allow an out-of-sample test of the HTT and the April restriction which PSS found was necessary to eliminate unprofitable trades.

The second section of the paper describes the HTT and the April restriction imposed by PSS. The third section reports the trading results for the HTT using data for the period January 1983-December 1989. The HTT was only 90 percent accurate in signaling trades during this period. However, when a seasonal restriction was added on trading in the February and April contracts (similar to the April restriction of PSS), all the losing trades were eliminated and the mean gross profit per trade

($154.79 per contract) was significantly greater than zero. The final section provides a summary and the conclusions.

HELMUTH TRADING TECHNIQUE

The HTT calls for selling live cattle futures when the futures price reaches the signal price, which is the sum of the Corn Belt cattle feeders' costs (U.S. Dept. of Agriculture) plus an Iowa-Southern Minnesota basis adjustment.[5] Helmuth used revised Corn Belt cattle feeders' cost data, whereas Pluhar, Shafer, and Sporleder used unrevised data.[6] This research used unrevised cost data.

The signal price for the HTT was calculated at the beginning of the six-month feeding period, for example, January 1st. The six-month forward live cattle futures contract (June) was monitored daily for a trading signal. The first time the daily high futures price was above the signal price, a short position was taken at the signal price. After a sale was made, the closing futures price was monitored on a daily basis until the market closed below the signal price. At this time, the short position was offset. No additional trades were allowed in a particular contract after the initial trade was made.

Palme and Graham (1981) attemped to discredit Helmuth's study based on methodological criticisms. One criticism was that Helmuth used basis figures that were not available at the time a sale of futures occurred. Helmuth used average basis values for the period 1968-81. These basis values were not available to a trader during Helmuth's study period from 1978-81. PSS calculated trading results for the HTT for 1974-82 using average Iowa-Southern Minnesota basis values for two different periods—

1968-81 (same basis values as Helmuth's); and 1971-82. Neither set of basis values were known by a trader during the PSS study period.

This study used a 10-year moving average of historical basis values that were known at the time a trade was made. A 10-year period was chosen based on Helmuth and PSS (who found that the HTT's success was "insensitive to alternative bases"). For example, for the feeding period ending in June 1983, the average June basis for the years 1973-82 was used as the basis adjustment for the June 1983 futures. For the feeding period ending in June 1984, the year 1973 was dropped and 1983 was added, so the 10-year average (of the June basis) was for the years 1974-83.[7]

PSS developed an alternative version of the HTT which required a minimum of an overnight holding period. For example, a sale that was made on Monday could not be offset until Tuesday at the earliest. (In the original HTT, a Monday sale could be offset at the Monday closing price.) The purpose for an overnight holding period was to give the market additional time to drop after a signal was given, and thus increase the profitability of the HTT. The HTT with an overnight holding period was simulated in this study.

SIMULATED TRADING RESULTS

The HTT was simulated over the seven-year period 1983-89. The first six-month feeding period began on January 1, 1983. The six-month forward futures was the June 1983 contract, which was monitored for a trading signal from January 1, 1983, to May 31, 1983.[8] The last feeding period began on December 1, 1989, and ended in June 1990. The June 1990

contract was monitored from December 1, 1989, to May 31, 1990, for a trading signal. The total number of feeding (trading) periods was 84.

The trading results for the HTT are reported in Table I, column 3. Forty-three trades were signaled by the HTT during the seven-year period January 1983 through December 1989 compared to 65 trades during the eight-and-one-half year period July 1974 through December 1982. A trade was signaled in 49 percent (41/84) of the feeding periods during 1983-89 compared to 64 percent (65/102) of the feeding periods during 1974-82. The percent of the signaled trades that was profitable was slightly lower during 1983-89. Ninety percent (37/41) of the signaled trades was profitable during 1983-89 compared to 95 percent (62/65) during 1974-82. The major difference in the trading results for the HTT between 1983-89 and 1974-82 was in the return figures. The mean gross profit per trade was negative for the HTT in the period 1983-89, whereas it was positive during the period 1974-82. Similar differences were found for the two time periods for the HTT with only overnight trades (Table I, column 4).

Helmuth argued that his trading technique would become unprofitable after it was disclosed (Staff of the House Committee on Small Business (1981); Smith (1981, p. 3)). The results in Table I support his conclusion. In individual trades for the original HTT and the HTT with only overnight trades (Table II), four large losses were responsible for the negative average returns for the 1983-89 period. Similarly during the 1974-82 period, three to five large losses were responsible for significantly reducing the average returns (although the averages were never negative as they were during 1983-89 (Pluhar, 1983, p. 78)).

PSS found during the period 1974-82 that losing trades occurred only in the April contract when a sale was made 90 days or more after the beginning of the feeding period (October 1st or November 1st). This led them to add a restriction to eliminate trades made during this period for the April contract. They found that the April restriction increased the average profit per trade to $224.27 for the HTT and $278.31 for the HTT with only overnight trades (compared to $96.37 and $82.22 for the unrestricted HTT's (Table I)). The mean gross profits for the restricted HTT's were significantly different from zero at the 0.001 level.

When the 90-day April restriction was applied to the results for 1983-89, only one losing trade was eliminated for both the HTT and the HTT with only overnight trades (i.e., the October 1986 placement). The 90-day restriction did not eliminate the losing trade in the April 1987 contract because the sale was made 85 days after November 1, 1986, the first day of the placement month. If the signal had been given 6 days later, the 90-day restriction would have eliminated the trade.[9] The two losses in the February contract were not eliminated by the April restriction.

The losses in the April contract were due to a strong seasonal rise in cattle prices that occurred from January to March. Prices typically rise during this period (Williams and Noseworthy (1977, p. 40); Trapp and Ward (1990)), and this was the reason cited by PSS for restricting trades in the April contract. Note in Table II that the losing trades in the February and April 1987 contracts were initiated during this period of strong seasonal rise in prices. After the sales were made in these contracts during late January 1987, prices continued to rise until the

end of the feeding period when the contracts were offset with large losses.

When sales were restricted for the February and April contracts after the first of the year, all the losing trades during 1983-89 were eliminated. With this restriction, eight fewer trades were signaled by the HTT and by the HTT with only overnight trades. The mean number of days a trade was held decreased, the standard deviation of the mean decreased, and the mean gross profit on the smaller number of trades increased and was significantly greater than zero at the 0.001 level. (Table I, columns 7 and 8).

The returns in Table I were not adjusted for the costs to execute a trade. The estimated execution cost was $50 per contract (i.e., $30 commission plus $20 , or two ticks, for the difference between the bid and ask prices). The mean returns net of transaction costs with the February-April restriction are $104.79 per contract for the HTT and $100.55 per contract for the HTT with overnight trades. Both mean net profits are significantly greater than zero at the 0.001 level.

The reader should be cautioned that the simulated trading results for the HTT with the February and April restrictions are within sample due to the fact that the February-April restriction was not specified at the first of the simulation period (but rather was formulated during 1983-89 based on the trading results for 1983-89). True out-of-sample results for the February-April restriction will not be available until sometime in the future when additional data are available.[10]

The return from a trading scheme (such as the HTT) depends on the risk involved in having money invested in the scheme. According to the

capital asset pricing model (CAPM), systematic risk is minimal in a live cattle futures trade because there is virtually zero correlation between cattle prices and financial asset prices (Arthur, Carter, and Abizadeh, 1988). Therefore, the return on an investment in physical cattle should be approximately equal to the risk-free rate. A live cattle futures contract, unlike physical cattle, does not require an up-front investment of money (other than a small margin which earns interest); and thus the expected risk-adjusted return on a cattle futures trade should be zero (Dusak). From 1983-89 the average return from trading the HTT was significantly greater than zero. The fact that significant profits were earned with the HTT suggests that pricing was not efficient in the live cattle futures market during this period.

Arbitrage pricing theory is an alternative means (to the CAPM) to evaluate risk and return. Results from arbitrage pricing studies indicate that agricultural assets have little systematic risk, and thus the return on agricultural assets should be low. Using an arbitrage pricing model, Arthur, Carter, and Abizadeh (1988) estimate the systematic risks and the associated prices (risk premia) for these risks for various agricultural assets including steers. Based on their results, the expected return above the risk-free rate for steers is estimated to be 0.645 percent per quarter. This rate can be applied to the trading results for the HTT to determine the risk-adjusted rate of return for a trade. The average time a short position was held open by the HTT was 3-4 days (Table I). The estimated return for a 4-day trade in live cattle futures is $0.0185 per cwt., that is, 0.000284 (0.00645*(4/91days in a quarter) times $65.38 (average sale price for the

HTT)). This is equal to a 4-day return of $7.40 for a 40,000 pound live cattle futures contract. The per contract net returns for the HTT ($100.55) and the HTT with only overnight trades ($104.79) are significantly greater than the expected risk-adjusted return ($7.40) at the 0.001 level, which supports the conclusion from the CAPM that pricing is not efficient in the live cattle futures market.

The fact that a systematic downward bias (in Helmuth's terms) exists in the live cattle futures market around signal days is not totally surprising. When the futures price reaches the signal level, cattle feeders hedge by selling cattle futures, and this causes the price to drop. The trading results from the HTT demonstrate the importance of the signal level as a natural selling point for cattle feeders (PSS, p. 19). The futures price will need to equal or exceed the signal level occasionally to encourage cattle feeding; however, because the signal level is a natural selling point, the price will tend not to go much above the signal level.[11]

The buying that is needed to counterbalance the selling that occurs on signal days is initially not large enough to prevent a drop in prices. An additional factor that may contribute to the drop in prices is the fact that speculators may avoid the long side of the market because they realize that selling by large feeding interests will pressure prices downward on, or after, signal days. A negative market psychology appears to develop when prices reach the signal level (PSS, p. 19).

It is widely felt that pricing is mostly efficient in speculative markets; however, this is not always the case as the trading results for the HTT indicate. Using a disequilibrium theory of pricing, Beja and

Goldman (1980) conclude that "it is intuitively inconceivable that a man-made institution (such as a market) could be so mechanically perfect that all such [price] discrepancies would be totally annihilated before they can be observed." According to efficient market theory, buying should approximately offset selling on signal days, and thus prevent the systematic drop in prices. The significant positive profits from the HTT indicate that this has not happened as efficient pricing theory suggests. Helmuth attributes the downward bias to the lack of commercial buying in live cattle futures relative to selling by large feedlots and other associated accounts. On signal days, the selling pressure outweighs the amount of buying, and the result is a drop in prices. The excess profits from the HTT are an indication of imperfections in the live cattle futures market and in cattle traders' strategies.

It appears that pricing is becoming less inefficient in the live cattle futures market because average returns from the HTT were lower during 1983-89 than 1974-82 (Table I). This confirms Helmuth's contention that disclosure of the HTT would reduce (and eventually eliminate) its profitability (Smith, 1981, p. 3).

SUMMARY AND CONCLUSIONS

Helmuth developed a trading technique that over the 37-month period from January 1978 to January 1981 predicted 29 drops in cattle futures prices with 100 percent accuracy. The mean gross profit per trade was $360 per contract. PSS re-evaluated the HTT and found that it was profitable over the period 1974-82; however, the mean gross profit per trade ($96.37) was not as high as during 1978-81. They discovered that

if a 90-day restriction was placed on trading in the April contract, the mean gross profit per trade increased to $224.27, which was significantly greater than zero. The results in this study for 1983-89 show that the mean gross profit per trade for the HTT was -$67.95 per contract. The April trading restriction proposed by PSS eliminated only one of two large losses in the April contract. And unlike the earlier period, there were two large losses in the February contract during 1983-89.

The strong seasonal rise in cattle prices after the first of the year was responsible for the large losses in the February and April contracts in 1987. PSS advised against a short position in the April contract during this period, and this research indicates that their advice should be extended to the February contract also. By restricting trades in the February and April contracts from January to April, the HTT predicted 33 drops in live cattle futures prices during 1983-89 with 100 percent accuracy. The mean net profit on these trades was significantly greater than the risk-adjusted return.

The key to successful application of the HTT in the past has been to avoid large losses that occurred during January through April when cattle prices exhibit a strong seasonal rise. PSS showed that the 90-day April restriction was effective in eliminating losing trades during 1974-82; however, results from trading the HTT for 1983-89 showed this was no longer the case. The simulated trading results for the entire period 1974-89 showed that a significant return could be earned if the 90-day April restriction used by PSS was broadened to eliminate all trades in the February and April contracts signaled during the period January through March. Further tests at a later time will be needed to determine

whether this restriction is sufficiently broad to eliminate all unprofitable trades (which have occurred in the past only in the February and April contracts for sales made during the period January through March).

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Footnotes

[1]The authors would like to thank Kary Mathis, Rex Kennedy, Phil Johnson, and two anonymous reviewers for their helpful comments.

[1]The journal article was based on earlier reports prepared by the Staff of the House Committee on Small Business (listed in the references).

[2]The Corn Belt cattle feeders' costs are all costs required by a small farmer feedlot to feed a steer from 600 to 1050 pounds over a six-month period (U.S. Department of Agriculture). These costs include that of the feeder, feed, interest, and other miscellaneous production items.

[3]Pluhar, Shafer, and Sporleder (1985) recalculated the trading results for the Helmuth trading technique for the same period (i.e., January 1978-January 1981). They report that 32 (rather than 29) trades were made during this period, and the mean gross profit per trade was $289.13 (rather than $360.) They claim that the different results are due to differences in the futures data bases used in their study and Helmuth's (Pluhar, 1983, p.72).

[4]Helmuth (1981) found that 32 large cattle traders with associated business interests were net sellers during price drops in the market. He questioned whether these traders were trading together, and whether their trading activity violated speculative position limits.

[5]The Iowa-Southern Minnesota basis was obtained from Gene Futrell at Iowa-State University in Ames, Iowa.

[6]Pluhar (1983) found that the trading results were virtually equivalent when using revised and unrevised cost data.

[7]Over the period 1973-89, the Iowa-So. Minnesota basis was mostly stable. The basis figures for each of the 12 months of the year were regressed on time (in 12 separate regressions), and the estimated slope coefficients were used to measure the trend in the basis. The slope coefficients were negative for 8 months and positive for 4 months; however, none of the estimated coefficients were significant at the 0.01 level. The absolute value of the trend change in the basis was greater than $0.15 per cwt. per year only for the month of May, where the trend decrease in the May basis was -$0.28 per cwt. per year. The May trend was the result of a sharp decrease in the May basis in 1987-89. Before 1987, the May basis had only a slight negative trend (-$0.04 per cwt. per year from 1973-86).

[8]Following PSS, a trade was not allowed in the delivery month (Pluhar, 1983, p. 41).

[9]It is interesting to note that one of the losing trades in the April contract during 1974-82 was triggered 98 days from the first of the placement month (Pluhar (1983, p. 79)). If this trade had been signaled only 8 days earlier, the 90-day restriction would not have eliminated the loss. The 90-day April restriction does not appear to be broad enough to eliminate losing trades (discussed below).

[10]An out-of-sample test of a trading rule requires that the trading rule is specified at the first of the trading period, and that information used by the trading rule is known at the time a trade is made. The trading results for 1983-89 for the original HTT and the HTT with the April restriction (from PSS) are examples of out-of-sample results because: (1) the HTT and the April restriction were specified by

Helmuth and PSS previous to the first day of the simulation period (January 1, 1983); and (2) the simulation of the HTT from 1983-89 used known (unrevised) feeding cost data.

[11]The futures price should be equal to the signal level (cost of production plus basis adjustment) at the beginning of the feeding period (referred to as rational price formation (Koontz, Hudson, and Hughes, 1990)). As one moves further away from the point in time when cattle are placed on feed, the deviation between the futures price and the signal price can be greater, as supply and demand factors take over and reduce the influence of production costs on price.

Table I

SUMMARY OF RESULTS FOR HELMUTH TRADING TECHNIQUE

Placement Month	Measure	Original[a]	Overnight Trades Required[b]	Original, April Restriction	Overnight Trades Required, April Restriction	Original, April & Feb. Restriction	Overnight Trades Required, April & Feb. Restriction
July 1974-							
Dec. 1982	Number of Trades	(3,65)/102[c]	(5,65)/102	(0,59)/102	(0,59)/102		
	Gross Profit--Mean[d]	96.37	82.22	224.27*	278.31*	Results are the same	
	Std. Dev.[e]	63.78	75.98	21.90	21.55	as with the April	
	Range	(-3440.,1012.)	(-3440.,1012.)	(4.,1012.)	(8,1012.)	restriction only.	
	Days Traded---Mean	3.83	5.75	2.53	3.68		
	Range	(1,42)	(2,42)	(1,16)	(2,27)		
Jan. 1983-							
Dec. 1989	Number of Trades	(4,41)/84	(4,41)/84	(3,38)/84	(3,38)/84	(0,33)/84	(0,33)/84
	Gross Profit--Mean	-67.95	-60.63	-3.21	4.68	154.79*	150.55*
	Std. Dev.	114.56	115.05	96.36	96.89	21.31	21.07
	Range	(-2934.,476.)	(-2934.,476.)	(-2842.,476.)	(-2842.,476.)	(4.,476.)	(10.,476.)
	Days Traded---Mean	4.79	5.68	4.00	4.76	2.88	3.70
	Range	(1,45)	(2,45)	(1,45)	(2,45)	(1,12)	(2,12)

[a]Original trading technique proposed by Helmuth.

[b]An overnight holding period was proposed by Pluhar (1983) to allow additional time for the market to drop after the signal day.

[c]The numbers in parentheses indicate the number of losing trades and the total number of trades, respectively. The number after the / is the maximum possible number of trades.

[d]Gross profit is in dollars per contract traded. An * indicates significantly different from zero at the 0.001 level.

[e]Standard deviation of the mean.

Table II

RESULTS FOR HELMUTH TRADING TECHNIQUE, 1983-89

Placement Month	Futures Contract	Break-even Price[a] + ($/cwt)	Basis[b] = ($/cwt)	Signal Price ($/cwt)	Signal Date	Gross Returns ($/cntr)[c] Original	Gross Returns ($/cntr)[c] Overnight Trades Required
Jan. 1983	June 1983	64.87	0.49	65.36	2-18-83	4. (1)[d]	34. (6)
Feb. 1983	Aug. 1983	67.29	-0.26	67.03	4- 6-83	162. (1)	212. (2)
Aug. 1983	Feb. 1984	66.15	0.61	66.76	12-20-83	64. (2)	64. (2)
Sept. 1983	Feb. 1984	66.37	0.58	66.95	12-21-83	140. (1)	10. (2)
Oct. 1983	April 1984	66.90	1.50	68.40	12-27-83	300. (2)	300. (2)
Nov. 1983	April 1984	67.40	1.53	68.93	1- 5-84	32. (1)	382. (2)
Oct. 1984	April 1985	66.86	1.54	68.40	11-21-84	30. (1)	20. (3)
Nov. 1984	April 1985	66.53	1.64	68.17	11-21-84	128. (4)	128. (4)
Dec. 1984	June 1985	67.14	0.39	67.53	12- 3-84	192. (1)	12. (2)
Jan. 1985	June 1985	68.22	0.58	68.80	1-28-85	10. (1)	120. (3)
Feb. 1985	Aug. 1985	68.60	-1.11	67.49	2-12-85	66. (1)	226. (2)
June 1985	Dec. 1985	65.81	1.73	67.54	11- 5-85	146. (1)	296. (2)
July 1985	Dec. 1985	62.43	1.19	63.62	10- 8-85	318. (2)	318. (2)
Aug. 1985	Feb. 1986	61.73	0.15	61.88	10- 3-85	152. (1)	202. (2)
Sept. 1985	Feb. 1986	60.44	0.69	61.13	10- 3-85	52. (3)	52. (3)
Oct. 1985	April 1986	60.87	1.72	62.59	10- 3-85	186. (1)	276. (2)
Nov. 1985	April 1986	62.04	1.91	63.95	1-27-86	260. (1)	350. (2)
Dec. 1985	June 1986	61.23	0.91	62.14	12- 2-85	146. (2)	146. (2)
Jan. 1986	June 1986	62.30	0.75	63.05	1-27-86	240. (1)	270. (2)
April 1986	Oct. 1986	61.08	0.49	61.57	8-29-86	18. (2)	18. (2)
May 1986	Oct. 1986	61.41	0.70	62.11	9- 2-86	234. (1)	64. (5)
June 1986	Dec. 1986	59.67	1.82	61.49	11-19-86	26. (1)	56. (3)
July 1986	Dec. 1986	59.19	1.34	60.53	10-31-86	382. (1)	92. (2)
Aug. 1986	Feb. 1987	60.43	0.18	60.61	1-26-87	-1186. (5)	-1186. (5)
Sept. 1986	Feb. 1987	59.11	0.73	59.84	1-26-87	-1494. (5)	-1494. (5)

Table II--Continued

Placement Month	Futures Contract	Break-even Price[a] + (\$/cwt)	Basis[b] = (\$/cwt)	Signal Price (\$/cwt)	Signal Date	Gross Returns: Original (\$/cntr)[c]	Gross Returns: Overnight Trades Required (\$/cntr)[c]
Oct. 1986	April 1987	58.40	1.74	60.14	1-26-87	-2934.(46)[d]	-2934.(46)
Nov. 1986	April 1987	58.63	1.74	60.37	1-26-87	-2842.(46)	-2842.(46)
Dec. 1986	June 1987	59.40	0.54	59.94	1-26-87	96.(14)	96.(14)
Jan. 1987	June 1987	61.45	0.51	61.96	2- 4-87	364. (2)	364. (2)
Feb. 1987	Aug. 1987	62.61	-0.98	61.63	4-10-87	102. (3)	102. (3)
March 1987	Aug. 1987	62.01	0.43	62.44	4-30-87	476.(10)	476.(10)
April 1987	Oct. 1987	64.42	0.32	64.74	8-10-87	146. (1)	46. (2)
May 1987	Oct. 1987	65.45	0.61	66.06	8-26-87	4. (1)	84. (2)
June 1987	Dec. 1987	66.17	1.49	67.66	9- 3-87	304. (9)	304. (9)
July 1987	Dec. 1987	66.97	1.11	68.08	9- 4-87	72. (6)	72. (6)
Aug. 1987	Feb. 1988	68.09	0.16	68.25	9- 4-87	90. (6)	90. (6)
Oct. 1987	April 1988	67.34	1.79	69.13	1-15-88	212. (4)	212. (4)
Nov. 1987	April 1988	69.37	1.70	71.07	2- 3-88	58. (2)	58. (2)
Dec. 1987	June 1988	69.66	-0.05	69.61	2- 5-88	154. (9)	154. (9)
Jan. 1988	June 1988	73.78	0.17	73.95	5-16-88	280. (1)	240. (2)
June 1988[e]	Dec. 1988	72.66	1.45	74.11	10- 3-88	24. (3)	24. (3)

[a]Selling price required to cover all feeding costs based on unrevised Corn Belt cattle feeding budget (U.S. Dept. of Agriculture).

[b]Average Interior Iowa-Southern Minnesota basis (futures price-cash price) for the previous ten years. For example, for cattle placed in January 1983, the \$0.49 is the average June basis for the years 1973-82.

[c]A live cattle futures contract is 40,000 pounds.

[d]Number of days a position was held--e.g., 1 day means that the position was entered and offset on the signal date; 2 days means the position was entered on the signal date and offset the following day; etc.

[e]The HTT did not signal a trade for cattle placed from July 1988 through December 1989.