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THE ABILITY OF THE FUTURES MARKET TO
FORECAST PROFIT MARGINS IN THE BROILER INDUSTRY*

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The typical vertically integrated broiler firm is faced with variable input costs, primarily corn and soybean meal, and variable sales revenues from selling its output, iced broilers, in the cash market. Therefore, the profit margins for the integrators can fluctuate widely from week to week. To cope with this situation broiler integrators can use the futures market to simultaneously lock-in the price of corn and soybean meal and the price of broilers therefore locking-in a profit margin. To lock-in this margin, the integrator buys corn and meal futures to set feed costs, and sells broiler futures to set the selling price of his broilers.

This paper presents a portion of the results of a study designed to determine the impact on income and income variance of various profit margin hedging strategies for an integrated broiler firm. To accomplish this objective, weekly production costs had to be estimated and compared to weekly broiler prices to determine actual weekly profit margins. These estimated weekly profit margins served as a benchmark for evaluating alternative hedging strategies. A formula to compute the expected net profit margins (ENPM), based on the daily futures prices and basis estimates for corn, soybean meal, and iced broilers was also needed. To assist in the development of hedging strategies, we analyzed the ENPM's generated by the given formula to determine whether the futures market can accurately forecast, within narrow limits, the actual net profit margins realized up to eight months before the actual marketing of birds. In this paper the ability of the futures market to forecast profit margins in the broiler industry is reported and discussed.

Representative Firm

The hypothetical integrated broiler-marketing firm is assumed to have a hatchery, feed mill, and processing plant located on the Eastern Shore of Maryland. It is also assumed that firm processes 500,000 birds per week, all of which are sold on the New York City (N.Y.C.) market.

Profit Margin Formula

A formula was developed to generate weekly profit margins by computing weekly costs and then subtracting these costs from the weekly New York City weighted average price for Grade "A" ready-to-cook iced broilers. All birds are assumed to be Grade "A". The equation used to estimate the actual net profit margins is given below in Equation 1.

(1) $ANPM = IB - [(CP/56) \times CCF + (SBMP/2000) \times SCF + OC/(.74 \times .965)$

$+ PROC + TRANS - OFFAL]$

where: ANPM = Actual weekly net profit margin,

  IB   = Weekly N.Y.C. cash price for Grade "A" broilers,

  CP   = Weighted average price of corn consumed per bushel for a given lot of birds,

  CCF   = Corn conversion factor (feed conversion ratio x % of corn in the feed ration),

  SBMP = Weighted average price of soybean meal consumed per ton for a given lot of birds,

  SCF   = Soybean meal conversion factor (feed conversion ratio x % of soybean meal in the feed ratio),

  OC   = Summation of the chick cost, fuel cost, contract payment, fixed ration, milling charge,

  .74   = Dressing yield,

  .965 = Adjustment for in-house mortality, D.O.A.'s, and condemnations,

  PROC = Cost of processing,

TRANS = Transportation cost to N.Y.C., and

OFFAL = Value of 1 lb. of offal per bird.

Weekly corn and soybean meal prices are weighted by the percentage of total corn and meal consumed weekly during the 8 week feeding period to determine CP and SBMP. The calculation (CP/56) computes the average total cost of corn on a per pound basis.

Basis

Before going into a detailed explanation of the formula used to compute ENPM's a brief discussion on basis is required. Basis is defined as the cash minus the nearby futures price. Basis describes the relationship of the cash price of a given commodity relative to a futures price. A September basis estimate for corn of +18 cents per bushel indicates the integrator expects the cash price of corn for his location during September to be 18 cents greater than the September futures price. Once basis estimates are computed for each commodity, the integrator has an idea of what a futures price of each commodity means at his location. A three year moving historical average was used to estimate basis. The futures price plus the estimated basis is referred to as the target price.

Expected Profit Margin

Given target prices for corn, meal, and broilers, ENPM's can be calculated. Using equation (1), substitute the target prices for corn, meal, and iced broilers for CP, SBMP, and IB respectively. To illustrate the method of calculating ENPM's, the following example is given. To calculate an ENPM for September 1970 on March 6, 1970, the September futures prices for corn, meal, and iced broilers along with basis estimates for September

of each commodity are needed. The prices and basis estimates used to calculate the September 1970 ENPM are given in Table 1. If a September contract is not available, prices of the nearby contract would be used. In this case a September contract is available for each commodity. This calculation is repeated each day for all available futures contract months. For example on March 6, 1970, ENPM's as far out into the future as November 1970 can be computed. These daily calculations were then compared to the actual net profit for a given month to determine whether the ENPM's underestimated, overestimated, or correctly forecasted the actual net profit margins.

Results

The difference between actual and estimated profit margins up to 8 months in advance for the years 1970-1975 are plotted on Figures 1 and 2 for the months of March and July, respectively.[1] The lines on these figures indicate the difference between forecasted profit margins through hedging for that month and the actual cash profit margin for that month. On Figure 1, during the month of July 1974, a profit margin of -2.4¢/lb. for the month of March 1975 could have been locked-in by hedging. Since the actual profit margin for March 1975 was 1.42¢/lb., the futures market underestimated the actual profit margin by 3.82¢/lb. Therefore, negative numbers indicate underestimation of the actual profit margin, while positive numbers indicate overestimation of the actual profit margin. The actual cash profit margin for the designated month by years is shown in the upper right-hand corner of each figure.

A futures market profit margin hedge does not accurately forecast actual profit margins. The most consistent relationship in Figures 1 and
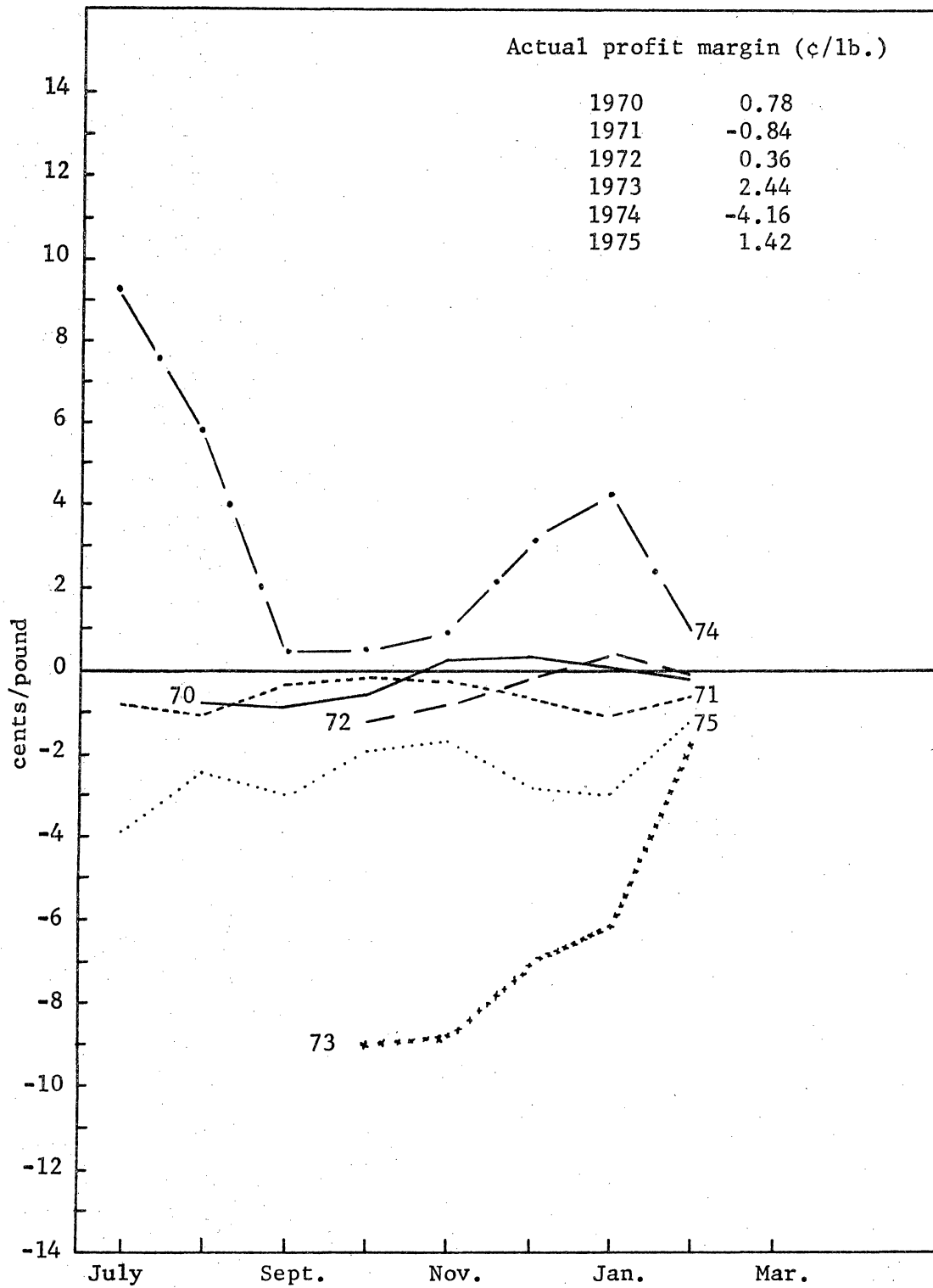
Figure 1. Difference between forecasted and actual profit margins for March, 1970-1975.
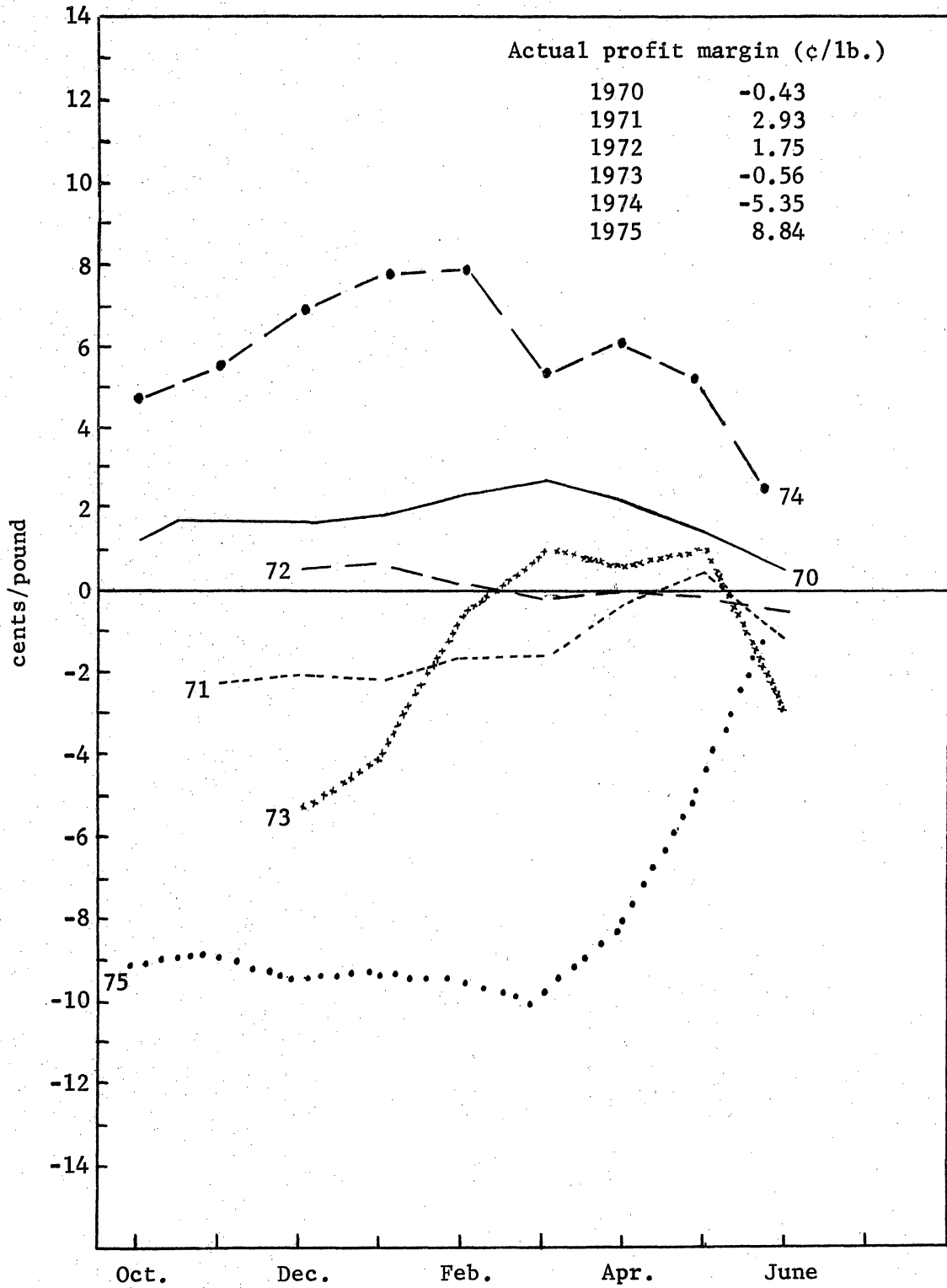
Figure 2. Difference between forecasted and actual profit margins for July, 1970-1975.

2 is that the 6 to 8 months in advance hedged profit margins are inversely related with subsequent actual profit margins. In other words, if 7 months in advance of the actual sale of the broilers a large negative profit margin is indicated by the futures market, the actual profit margin will be considerably less negative or even positive. The reverse is also true. If the futures market estimates a large positive profit margin 7 months in advance, generally the actual profit margin will be a small positive or a negative margin. Table 1 below demonstrates this relationship for the months of March and July.

For each year in Table 2, the futures market forecast and the actual profit margin are inversely related with the exception of July 1971. This relationship indicates that the seven month forecast period is long enough for broiler integrators to respond to expected profit margins. Therefore, when integrators observe a negative future profit margin, they can cut back chick placements. Subsequently, broiler output declines, broiler prices increase, and a positive (or less negative) profit margin than was originally forecast results. These results suggest that integrators should not hedge at forecast profit margins that are more negative than the historical average profit margin for a given month. Conversely, integrators should lock-in any positive margins larger than the historical average profit margin for that month. Hedging strategies are currently being developed and tested along these lines. This inverse relationship between forecast and actual profit margins existed for all 12 months of the year.

The second most striking feature of Figures 1 and 2 is the big change in profit margins from 1970, 1971, 1972 compared to 1973, 1974, 1975. Rapidly increasing corn, soybean meal, and fishmeal prices and price freezes in 1973 set in motion a set of circumstances which were still being felt in

Table 1. Futures prices and basis estimates used to compute ENPM for September 1970.

Date	Commodity	Futures prices	+	Basis estimates	=	Target prices
3/6/70	Corn	$1.23¼/bu.		$+.18/bu.		$1.41¼/bu.
	Meal	$71.00/ton		$21.60/ton		$92.60/ton
	Broilers	$.2740/lb.		0		$.2740/lb.

Table 2. Futures market seven month forecast compared to actual profit margin for March and July, 1970-1975.

Year	March		July	
	August forecast	March actual	Dec. forecast	July actual
	------------------------ ¢/lb. ------------------------			
1970	0.17	+0.78	1.20	-0.43
1971	-1.87	-0.84	0.91	2.93
1972	-0.85*	+0.36	2.22	1.75
1973	-6.71	+2.44	-5.66	-0.56
1974	5.12	-4.16	1.58	-5.35
1975	-2.40	+1.42	-0.67	8.84

*October forecast (futures prices not available in August and September).

1975 in the form of widely fluctuating prices and profit margins. As a result, the futures market tended to forecast negative profit margins in the future when current margins were negative. For example, in October, November, December 1972 when increased feed cost made broiler production very unprofitable, the futures market underestimated by a wide margin the actual profit margin for March 1973 (Figure 1). Likewise, in July and August 1973, when profit margins in broiler production were very favorable, the futures market substantially overestimated the actual profit margin of March 1974. This same pattern exists in July (Figure 2) and the other months not shown.

Some of the months show a definite tendency to underestimate or overestimate the actual profit margin. Figure 1 indicates a definite downward bias in estimating the March profit margin. Table 3 below indicates whether the futures market profit margins tend to over or underestimate actual profit margins in various months. The downward bias in December, January, February and March indicates strategies should be devised to take this tendency into consideration.

None of the months demonstrate a consistent seasonal pattern in its forecasts of actual profit margins. That is, the futures market does not seem to consistently on a yearly basis over or underestimate the actual profit margin 2, 3, or 4 months in advance.

All of the months indicate that the futures market forecast of the profit margin generally converges toward the actual profit margin as the length of the forecast declines. However, as Figures 1 and 2 indicate, this is not a monotonic convergence. Convergence was less complete and more volatile in months without a futures delivery contract for broilers.

Table 3. Bias in futures market forecast of actual profit margins by
          months, 1970-1975.

Month	Nature of Bias
January	Under
February	Under
March	Under
April	Nuetral
May	Nuetral
June	Over
July	Over
August	Nuetral
September	Under
October	Nuetral
November	Nuetral
December	Under

Conclusions

The futures market, using corn, soybean meal, and broiler futures con-
tracts, does not accurately forecast profit margins 6 to 8 months in advance.
To the contrary, the six to eight month futures market forecasts are inversely
related to actual profit margins. The current level of profits influences
forecasted profit margins more than expected conditions 6 to 8 months in
the future. Using Tomek and Gray's (2) terminology, the futures market for
broilers is a forward-pricing market since continuous inventories do not
exist. Since the greatest source of variation in the ENPM's arises from
fluctuating broiler futures prices, the futures market for broilers does
not appear to be a good forecaster of future prices, and thus future profit
margin. Leuthold (1) found that the cattle futures market is not a very
reliable forecaster beyond 4 months. Our results tend to collaborate these
earlier studies.

In terms of selecting hedging strategies, two important implications
arise. First, since forecasted and actual profit margins vary inversely,
positive profit margins should be locked-in quickly, while negative profit
margins should not. Second, the futures market has a definite tendency to
underestimate actual profit margins for the months of December, January,
February and March. These two findings are currently being used to develop
alternative hedging strategies to determine if the futures market can be
used to increase broiler integrators' profit margins and/or reduce profit
margin variance.

FOOTNOTES

[1]Similar figures were constructed for each month. Due to space limitations, only two of the figures are presented.

REFERENCES

(1) Leuthold, Raymond M., "Price Performance on the Futures Market of a Nonstorable Commodity: Live Beef Cattle," *American Journal of Agricultural Economics*, 57:410-419, August 1975.

(2) Tomek, William G. and Roger W. Gray, "Temporal Relationships Among Prices of Commodity Futures Markets: Their Allocative and Stabilizing Roles," *American Journal of Agricultural Economics*, 53:71-78, August 1970.