Measuring Efficiency in the Beef-Pork Sector by Price Analysis

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The price structure of the beef-pork sector from the retail level back to the primary production level is evaluated in order to identify areas of inefficient performance. Results indicated efficient pricing performance between the slaughter and the retail levels. Results between the ranch and feedlot levels indicated a weak and distorted price structure. This appeared to be due to the inability of the price system to serve both as a mechanism of trade and as a signal for the organization and timing of future production. Key words: Price performance, efficiency, space, time, form.

To the casual observer, the pricing activities of the livestock-meat industry might appear chaotic. Such an impression would be easy to develop with the multitude of products and byproducts, seasonal and general price variations, and the complicated logistics involved in producing, distributing, and storing the industry's output.

In recent years critics have questioned the ability of the competitive structure of the livestock-meat industry to perform efficiently as a mechanism of trade and a guide for production. This paper describes a study which disclosed that there may be some justification for such a viewpoint. The objectives of the study were to evaluate specific price relationships of the beef-pork sector and to delineate areas of disorderly or inefficient production and marketing performance from the resulting price evidence.

Before any judgment on efficiency can be rendered, a valid standard must be postulated as a basis for comparison. The standard used in this analysis is the long-run competitive equilibrium specification for rates of production and marketing which result in price levels and differentials in space, time, and form that are consistent with minimal production, distribution, and storage costs. A rigorous analysis of the marketing system for beef and pork would involve a microeconomic appraisal of least-cost equilibrium transfers from each level of the system to the next. However, a cruder price analysis based on assuming approximately constant transfer costs (for 1957-66, the study period) will prove workable and still might provide a basis for comparative evaluation of production and marketing performance. Although some losses occur through this simplification, gains result from greater clarity and manageability, hopefully without significantly distorting the interrelations of the major forces involved in product pricing.

Relationships between prices and quantities for the beef-pork sector, from primary production at the farm or ranch to final consumption as beef and pork, were analyzed. Theoretical estimation techniques are discussed briefly. Primary concern is presentation and evaluation of statistical and economic results to ascertain areas of inefficient performance in the industry.

Beef and Pork at Retail

The analysis assumes that domestic civilian quantities consumed during the period were equivalent to production less changes in storage inventories, import-export balances, and military consumption. Price levels were assumed to be flexible and dependent on the predetermined supply volumes that had to clear the market. Separate price functions for beef and pork were fitted using the simple least-squares multiple regression technique. The usual tests of goodness of fit were applied.

The beef and pork equations estimated quarterly for the United States from 1957 to 1966 in linear form are:

$$(1)\quad P_1 = \underset{}{78.33983} - \underset{(0.34372)}{2.72784\, X_1} - \underset{(0.75145)}{1.45827\, S_1} - \underset{(0.74229)}{0.93549\, S_2} + \underset{(0.78934)}{2.08688\, S_3} + \underset{(0.00423)}{0.03673\, X_3}$$

$$R^2 = 0.693$$

$$P_2 = 132.28963 - \underset{(0.59060)}{1.54889 X_1} - \underset{(0.53225)}{5.02065 X_2}$$

(2)

$$- \underset{(1.43948)}{6.96960 S_1} - \underset{(1.66744)}{11.05847 S_2} - \underset{(0.83342)}{8.43848 S_3}$$

$$+ \underset{(0.00723)}{0.02559 X_3} \qquad R^2 = 0.806$$

where

P_1 = retail beef price (cents per pound).
P_2 = retail pork price (cents per pound).
X_1 = quarterly per capita consumption of beef and veal (carcass equivalent).
X_2 = Quarterly per capita consumption of pork (carcass equivalent).
X_3 = per capita disposable income at annual rates (dollars), deflated by the index of consumer prices (1957-59 = 100).
S_1 = dummy variable for seasonal variation in winter quarter.
S_2 = dummy variable for seasonal variation in spring quarter.
S_3 = dummy variable for seasonal variation in summer quarter.

The signs of all the coefficients in the estimating equations agree with economic theory. The standard errors of the coefficients are in parentheses. Results of the *t*-test in the retail beef price equation indicate that per capita consumption of beef and disposable income are significant at the 0.01 level, while seasonal variation in summer is significant at the 0.05 level. Although seasonal variations in winter or spring are not significant in this equation, they were included on the grounds that they removed some of the interaction through time within the estimating system. Results of the *t*-test in the retail pork equation indicate that all variables except per capita consumption of beef and veal are significant at the 0.01 level, while consumption of beef and veal is significant at the 0.05 level. The independent variables in the beef equation explain 69 percent of the variation in retail beef price, while the independent variables in the pork equation explain 81 percent of the variation in retail pork prices. The coefficients of determination are significant in both equations at the 0.01 level. The standard errors of estimate are 1.65 cents per pound above and below the mean for the beef equation, and 2.82 cents per pound for the pork equation.

Both the beef and pork equations were estimated in linear form. Therefore, the property of nonconstant elasticity, a feature of linear demand functions, presents a problem for the selection of meaningful points for quantification. The following quarterly consumption rates and annual income rates were selected for evaluating the elasticities of the beef-pork estimates: $X_1 = 27.5$, $X_2 = 16.25$, and $X_3 = 2{,}350$. These values appear consistent for the present and near future. In the quantity dependent form, the beef and pork demand functions are:

(3) $$X_1 = 28.71863 - 0.36659 P_1 - 0.53459 S_1 - 0.34294 S_2 + 0.76503 S_3 + 0.01346 X_3$$

(4) $$X_2 = 26.34910 - 0.30850 X_1 - 0.19918 P_2 - 1.38819 S_1 - 2.20260 S_2 - 1.68076 S_3 + 0.00510 X_3$$

The most influential factor in retail prices of beef and pork is per capita consumption of beef. The price elasticities of demand are – 1.19 for beef and – 0.84 for pork. Although not a precise measure of consumer demand, the values obtained suggest an elastic response in the quantity of beef consumed to changes in the retail price of beef, while pork consumption is inelastic in response to changes in the price of pork.

The income elasticity of demand, a measure of the change in the consumption rate corresponding to a change in personal disposable income, was 1.15 for beef and 0.74 for pork. This would indicate, other things being equal, that per capita consumption of beef would increase at a faster rate than pork with increases in personal disposable income. Past evidence has tended to indicate that consumers prefer beef to pork (*1*, pp. 70-77).[1] If trends continue into the future with rising personal income, beef producers will benefit more than pork producers.

In the estimated function for retail beef prices it was found that per capita consumption of pork was not statistically significant. However, per capita consumption of pork as well as beef was found to be significant in the retail price of pork. This appears contrary to past analyses of these two products (*4*, pp. 12-13). The following argument may help to explain these results: With the rapid rise in personal income during the last decade, variations of beef and pork prices were offset by the income effect. When the price of beef increased relative to pork price, consumers preferred to maintain their consumption of beef and accept a temporary

[1]Italic numbers in parentheses indicate items in the References, p. 17.

decrease in real income rather than substitute pork for beef. Conversely, during periods of increased pork prices [relat]ive to beef price, consumers shifted from pork to beef consumption. The argument maintains that once a level of beef consumption has been attained, the consumer will not retreat to a less preferred good for small changes in retail price. Some caution should be exercised, however, before accepting this relationship too readily.

The coefficients for seasonal variation shift the demand curve to the right or left, to reflect differences between average quantities consumed in the fall quarter and those consumed during the other seasons, at the same price. The coefficients of seasonal variation for beef indicate that the consumption rates decrease 0.53 pound per capita in winter and 0.34 pound in spring, and increase 0.77 pound in summer, relative to fall quarter levels. Fall consumption is contained in the constant term of the estimate. In the pork estimates, per capita consumption decreases below the fall quarter rate by 1.39 pounds in winter, 2.20 pounds in spring, and 1.68 pounds in summer.

Wholesale-Retail Beef Price Relationships

The price system at the wholesale level serves as a [me]chanism for distributing beef carcasses and semi-[dre]ssed pork cuts from meatpackers to retail outlets. Beef is generally quoted on a whole-carcass basis for carlot loads. Pork, on the other hand, is quoted as wholesale cuts, at less than carlot loads, in the form of semidressed loins, boston butts, hams, bacon slabs, etc. Because of the aggregation problem and the complexity of the wholesale pork market, quantification of the performance between the wholesale and retail markets was not attempted in this study. The study did, however, measure the industry performance between the retail and the slaughter levels.

Price relationships between levels were estimated for the period from 1957 to 1967 by months as follows:

$$(5)\quad P_{w_1} = \underset{}{9.96677} + \underset{(0.03842)}{0.74830\,P_1} - \underset{(0.82630)}{12.95590\,W_r} - \underset{(0.15065)}{0.60680\,X_1} \qquad R^2 = 0.804$$

where

P_{w_1} = price of Choice beef carcasses 601 to 700 pounds at Chicago (dollars per hundredweight).

P_1 = retail price of beef and veal (cents per pound).

W_r = wage rate for food and kindred product workers (dollars per hour).

X_1 = first difference in per capita consumption between quarters $(X_t - X_{t-1})$.

The signs on the first two coefficients agree with economic theory. Standard errors of the coefficients are in parentheses. The standard error of estimate is $1.49 per hundredweight.

The coefficient for the retail beef price is 0.75, reflecting the approximate carcass yield between the wholesale and retail levels for Choice beef carcasses. The variable for wage rates represented the cost of preparing carcass beef for retail sales. The coefficient implies a cost of $13 per hundredweight, reflecting the retail cost of cutting and trimming, advertising, overhead, transportation, labor, and locker shrinkage. The coefficient for the difference in per capita consumption represented the delay in adjustment to consistency between wholesale and retail prices (*6*, pp. 19-20). This results in alternate periods of gain or loss at the wholesale or retail level, depending on increasing or decreasing supplies of beef which create short-period "buyer" or "seller" marketing conditions. In general, the above estimating equation indicates good price performance between the wholesale and retail levels.

Beef Carcass Prices, by Grade and Weight

The following relationships estimated the horizontal price performance at the wholesale level between various weights and grades of beef carcasses. Choice grade carcasses, 601 to 700 pounds, were chosen as the base. Theoretically, if the price mechanisms were performing efficiently, the regression coefficient should be near 1 (reflecting relative retail cut yield rates), and the constant term equal to the average weight or grade differential for the given comparison. The equations were estimated as follows:

$$(6)\quad P_{w_2} = 0.99811 + \underset{(0.02068)}{0.95982\,P_{w_1}} \qquad r^2 = 0.948$$

$$(7)\quad P_{w_3} = 0.08362 + \underset{(0.03456)}{0.96180\,P_{w_1}} \qquad r^2 = 0.868$$

$$(8)\quad P_{w_4} = 0.49322 + \underset{(0.02231)}{0.93471\,P_{w_1}} \qquad r^2 = 0.937$$

$$(9)\quad P_{w_5} = 4.54895 + \underset{(0.02629)}{0.84482\,P_{w_1}} \qquad r^2 = 0.897$$

where

P_{w_1} = wholesale price of 601- to 700-pound Choice beef carcasses at Chicago (dollars per hundredweight).

P_{w_2} = wholesale price of 701- to 800-pound Choice beef carcasses at Chicago (dollars per hundredweight).

P_{w_3} = wholesale price of 801- to 900-pound Choice beef carcasses at Chicago (dollars per hundredweight).

P_{w_4} = wholesale price of 601- to 700-pound Good beef carcasses at Chicago (dollars per hundredweight).

P_{w_5} = wholesale price of 501- to 600-pound Good beef carcasses at Chicago (dollars per hundredweight).

The standard errors are 0.75, 1.25, 0.81, and 0.95 per hundredweight, respectively.

The relationships are sufficiently strong to suggest efficient price performance between the various weights and grades at the wholesale level. The regression coefficients are slightly less than 1 for the two Choice and heavy Good grade carcasses, while the constant terms are slightly greater than zero. This implies very little weight or grade differential value for these carcasses. The coefficient for the 501- to 600-pound Good grade carcasses is considerably lower at 0.84, while the constant term is higher at 4.54. The distortions in the estimated functions could have resulted from the narrow range in the data during the time period tested and the usual flattening fit from simple least squares. These two factors combined to tip the regression lines, yielding regression coefficients which were less than might be expected while at the same time forcing the constant terms to intersect the axis higher than expected. The above results, however, are adequate for forecasting purposes, and would probably yield estimates with errors of no more than 1 or 2 percent.

Slaughter-Wholesale Beef Price Relationships

In addition to examining the slaughter-to-wholesale level, this section links the slaughter-to-retail structure. The price of Choice steers, 900 to 1,100 pounds, was used as the base price. The relationships were estimated using monthly prices from 1957 to 1966 as follows:

$$(10)\quad P_{c_1} = -4.35784 + \underset{(0.01482)}{0.68975}\,P_{w_1} + \underset{(0.01702)}{0.19009}\,t \qquad R^2 = 0.951$$

$$(11)\quad P_{c_1} = -3.06539 + \underset{(0.02768)}{0.52421}\,P_1 - \underset{(0.59443)}{6.27350}\,W_r \qquad R^2 = 0.7$$

where

P_{c_1} = price of Choice slaughter steers, 901 to 1,100 pounds, at Omaha (dollars per hundredweight).

P_{w_1} = price of Choice beef carcasses, 601 to 700 pounds, at Omaha (dollars per hundredweight).

P_1 = retail price of beef and veal (cents per pound).

t = annual trend (1957 = 1).

W_r = wage rates for food and kindred product workers (dollars per hour).

The signs of all of the coefficients agree with economic theory. The standard errors of the estimate are \$0.049 and \$1.07 per hundredweight, respectively.

The coefficient for carcass beef price in the slaughter-to-wholesale equation indicated a liveweight-to-carcass yield of 69 percent. The coefficient for annual trend indicated an increase in the slaughter prices of 19 cents per hundredweight per year. Secular trends in plant efficiency and more direct selling could support this result.

In the second equation, the coefficient for retail price indicates a liveweight-to-retail yield of 52 percent. This yield rate appears to be consistent with yield rates found in the earlier analyses, from wholesale to retail and slaughter to wholesale.

Slaughter-Retail Pork Price Relationships

Since the relationship between wholesale and retail prices for the pork industry was not estimated, the relationship between slaughter and retail prices is examined in this section. Theoretically the price margin between the two levels should reflect the retail pork yield, minus the cost of processing and distribution, plus the value of any byproducts salvaged in the slaughter-to-retail movement. The relationship was estimated as follows:

$$(12)\quad P_{h_1} = -12.77266 + \underset{(0.02180)}{0.55540}\,P_2 - \underset{(0.72409)}{1.34337}\,W_r \qquad R^2 = 0.855$$

where

P_{h_1} = price of No. 1-3 butcher hogs at Omaha, 220 to 240 pounds (dollars per hundredweight).

where

P_{w_1} = wholesale price of 601- to 700-pound Choice beef carcasses at Chicago (dollars per hundredweight).

P_{w_2} = wholesale price of 701- to 800-pound Choice beef carcasses at Chicago (dollars per hundredweight).

P_{w_3} = wholesale price of 801- to 900-pound Choice beef carcasses at Chicago (dollars per hundredweight).

P_{w_4} = wholesale price of 601- to 700-pound Good beef carcasses at Chicago (dollars per hundredweight).

P_{w_5} = wholesale price of 501- to 600-pound Good beef carcasses at Chicago (dollars per hundredweight).

The standard errors are 0.75, 1.25, 0.81, and 0.95 per hundredweight, respectively.

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where

P_{c_1} = price of Choice slaughter steers, 901 to 1,100 pounds, at Omaha (dollars per hundredweight).

P_{w_1} = price of Choice beef carcasses, 601 to 700 pounds, at Omaha (dollars per hundredweight).

P_1 = retail price of beef and veal (cents per pound).

t = annual trend (1957 = 1).

W_r = wage rates for food and kindred product workers (dollars per hour).

The signs of all of the coefficients agree with economic theory. The standard errors of the estimate are \$0.049 and \$1.07 per hundredweight, respectively.

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where

P_{h_1} = price of No. 1-3 butcher hogs at Omaha, 220 to 240 pounds (dollars per hundredweight).

P_2 = retail price of pork excluding lard (cents per pound).

W_r = wage rates for food and kindred product workers (dollars per hour).

The signs of the coefficients agree with economic theory. The standard error of estimate is $1.35 per hundredweight.

The uncorrelated marketing costs of processing, storage, cutting and trimming, etc., plus the value of salvaged byproducts and lard, are contained in the constant term. Costs correlated with wage rates are represented in the coefficient for wage rates. Their combined net value suggested a net cost of approximately $15.50 per hundredweight of live hog. This value seems reasonably close to present industry standards. The coefficient on retail price accurately indicates a 55 percent yield rate for live to retail conversion (excluding lard). Overall, the estimating equation suggests efficient marketing performance for the pork industry from the slaughter to the retail level.

Slaughter Cattle Prices by Weights, Grades, and Classes

Theoretically, the relationships between prices for the various weights, grades, and classes of beef cattle should reflect the relative yields, and the value of premiums or discounts for weight, grade, or class. In the analysis, Choice steers at Omaha, 900 to 1,100 pounds, were chosen as the base. The relationships were estimated as follows:

(13) $P_{c_2} = -0.56483 + 1.02122\,P_{c_1}$ $\quad r^2 = 0.985$
(0.01143)

(14) $P_{c_3} = 0.35661 + 0.89833\,P_{c_1}$ $\quad r^2 = 0.945$
(0.02002)

(15) $P_{c_4} = -2.26548 + 1.14684\,P_{c_1}$ $\quad r^2 = 0.938$
(0.02712)

(16) $P_{c_5} = 0.81024 + 0.93793\,P_{c_1}$ $\quad r^2 = 0.959$
(0.01787)

(17) $P_{c_6} = 0.90758 + 0.85018\,P_{c_1}$ $\quad r^2 = 0.903$
(0.02561)

where

P_{c_1} = price of Choice slaughter steers at Omaha, 900 to 1,100 pounds (dollars per hundredweight).

P_{c_2} = price of Choice slaughter steers at Omaha, 1,100 to 1,300 pounds (dollars per hundredweight).

P_{c_3} = price of Good slaughter steers at Omaha, 900 to 1,100 pounds (dollars per hundredweight).

P_{c_4} = price of Prime slaughter steers at Omaha, 1,100 to 1,300 pounds (dollars per hundredweight).

P_{c_5} = price of Choice slaughter heifers at Omaha, 800 to 1,000 pounds (dollars per hundredweight).

P_{c_6} = price of Good slaughter heifers at Omaha, 700 to 900 pounds (dollars per hundredweight).

The standard errors of estimate are 27, 47, 64, 42, and 60 cents per hundredweight, respectively.

The coefficients of determination suggest strong substitution forces between the various weights, grades, and classes, indicating efficient performance in the price mechanism at the slaughter level. The constant terms and regression coefficients generally indicate price premiums paid for weight and quality differences in the heavy Choice and Prime grades. Discounts were evident in the Good grade and heifer classes. Improvements in the estimating technique, by using an error-in-variable model, could improve the consistency of the regression slope and intercept values. For purpose of forecasting, the above estimating equations accurately measure the price differentials for weight, grade, and class.

Slaughter Hog Prices by Weights and Locations

The price for 220- to 240-pound slaughter hogs on the Omaha market served as the basis for the analysis. In an efficient market the price relationships should reflect the relative yields and resulting premiums or discounts for each weight class. Differences in price between locations, for the same weight class, should be equal to the differences in transportation cost between the locations and a common outlet. The equations estimated monthly from 1957 to 1966 are as follows:

(18) $P_{h_2} = -0.09246 + 1.00708\,P_{h_1}$ $\quad r^2 = 0.999$
(0.00154)

(19) $P_{h_3} = -0.19895 + 0.99157\,P_{h_1}$ $\quad r^2 = 0.995$
(0.00662)

(20) $P_{h_4} = -0.38904 + 0.89066\,P_{h_1}$ $\quad r^2 = 0.946$
(0.01950)

(21) $P_{h_5} = -0.28552 + 1.00124\,P_{h_1}$ $\quad r^2 = 0.996$
(0.00580)

$$(22)\quad P_{h_6} = 0.36762 + 0.97938\,P_{h_1} \qquad r^2 = 0.996$$
$$(0.00593)$$

$$(23)\quad P_{h_7} = 0.53809 + 0.97951\,P_{h_1} \qquad r^2 = 0.994$$
$$(0.00701)$$

where

P_{h_1} = price of No. 1-3 slaughter hogs at Omaha, 220 to 240 pounds (dollars per hundredweight).

P_{h_2} = price of No. 1-3 slaughter hogs at Omaha, 200 to 220 pounds (dollars per hundredweight).

P_{h_3} = price of No. 1-3 slaughter hogs at Omaha, 240 to 270 pounds (dollars per hundredweight).

P_{h_4} = price of No. 1-3 slaughter sows at Omaha, 330 to 400 pounds (dollars per hundredweight).

P_{h_5} = price of No. 1-3 slaughter hogs at St. Paul, 220 to 240 pounds (dollars per hundredweight).

P_{h_6} = price of No. 1-3 slaughter hogs at St. Louis, 220 to 240 pounds (dollars per hundredweight).

P_{h_7} = price of No. 1-3 slaughter hogs at Indianapolis, 220 to 240 pounds (dollars per hundredweight).

The standard errors of estimate are 6, 25, 74, 22, 23, and 27 cents per hundredweight, respectively. The values of r^2 for the above equations indicate that strong competitive forces exist in the bidding for slaughter hogs. The evidence supports an efficient performance by the price mechanism at the slaughter level. The prices paid for 220- to 240-pound hogs at Omaha explain from 95 to 99 percent of the variation in the prices of hogs for various weights, classes, and location. The regression coefficients and constant terms accurately reflect yield and price differentials for grades and weights of slaughter hogs. In the location estimates, transportation cost differences per hundredweight are represented by the values of the constant terms. The constant terms tend to reflect the proximity to major pork consumption centers.

Feeder-Slaughter Cattle Price Relationships

Analysis of the prices paid for feeder animals and their eventual slaughter price requires lagging the price of feeder animals equivalent to a period of time necessary to fatten the animal from feeder weight to slaughter weight. The price of 901- to 1,100-pound Choice slaughter steers at Omaha was chosen as the base price. Theoretically, if orderly equilibrium producing decisions were being made and were reflected in the price structure, the regression coefficients and the constant terms should reflect cost of gain and feeding efficiency margins between the feeder and slaughter prices. Feeding costs were generally constant over the period so no feed price was used in the functions. The relationships were estimated using average monthly prices from 1957 to 1966 as follows:

$$(24)\quad P_{f_{2t-3}} = 9.08457 + 0.53576\,P_{c_{1t}} \qquad r^2 = 0.246$$
$$(0.08627)$$

$$(25)\quad P_{f_{3t-4}} = 11.59478 + 0.47352\,P_{c_{1t}} \qquad r^2 = 0.147$$
$$(0.10504)$$

$$(26)\quad P_{f_{4t-6}} = 17.10627 + 0.32310\,P_{c_{1t}} \qquad r^2 = 0.050$$
$$(0.12893)$$

where

$P_{c_{1t}}$ = price of Choice slaughter steers at Omaha, 901 to 1,100 pounds (dollars per hundredweight).

$P_{f_{2t-3}}$ = price of feeder steers at Omaha, 801 to 900 pounds, lagged 3 months (dollars per hundredweight).

$P_{f_{3t-4}}$ = price of feeder steers at Omaha, 701 to 800 pounds, lagged 4 months (dollars per hundredweight).

$P_{f_{4t-6}}$ = price of feeder steers at Omaha, 501 to 700 pounds, lagged 6 months (dollars per hundredweight).

The standard errors of estimate are \$1.94, \$2.34, and \$2.84 per hundredweight, respectively. The values of r^2 are extremely low in all three equations. If production and marketing were orderly, the base slaughter prices for 900- to 1,100-pound steers should be expected to explain at least 80 percent of the variations in prior feeder steer prices. The values of r^2 on each of the estimating equations indicate that the lighter the feeder steer the less consistent is the evidence.

If the marketing system for feeder animals were performing efficiently, the regression coefficient would be approximately the ratio of slaughter to feeder weight, and the constant term would reflect the average supply cost per hundredweight of moving the animal from a feeder class to a slaughter class. However, in the above three equations, none of the regression coefficients or constant terms consistently reflect these relationships—the lighter the feeder animal, the greater the distortion from the expected value. The estimates indicate that prices paid for feeder animals are not based on expected future slaughter price, but rather on the existing slaughter price at the time of the feeder animal purchase. Also, aggregate industry decisions produce levels and marketing patterns which are inconsistent with continuous dynamic equilibrium (5, pp. 9-12; 49-55).

If the previous three equations were estimated without lags, the results would indicate the influence of existing slaughter prices on the bidding for feeder animals. The relationships were estimated in the same way as the previous equations, with the exception of the lags, and are as follows:

(27) $P_{f_{2t}} = -0.51070 + \underset{(0.04920)}{0.93168} P_{c_{1t}}$ $\quad r^2 = 0.752$

(28) $P_{f_{3t}} = -1.16446 + \underset{(0.06496)}{0.99561} P_{c_{1t}}$ $\quad r^2 = 0.666$

(29) $P_{f_{4t}} = -1.39168 + \underset{(0.08290)}{1.07438} P_{c_{1t}}$ $\quad r^2 = 0.587$

The prices paid for feeder animals seem to be influenced more by current slaughter prices than by expected slaughter prices (or expected prices are strongly based on current prices), since the r^2 values are considerably higher in these latter estimates. However, the relationships are not strong enough to support the conclusion that feeder prices are based solely on existing slaughter prices. The evidence does show, however, that existing slaughter prices strongly influence the prices paid for feeder animals. Consequently, one must conclude that the greatest degree of disorderly performance is in the time dimension between the ranch and feedlot levels.

Implications

The relationships in the preceding analyses reflect strong competitive forces which produce efficient performance from the slaughter to the retail level. This would indicate that improvements in production and marketing of cattle and hogs to the slaughter level could yield substantial industrywide payoff.

Relationships between the prices of slaughter and feeder cattle were found to be very weak and distorted. Results indicated that prices paid for feeder animals did not reflect their future value as slaughter animals. Because feedlot operators were unable to correctly anticipate future slaughter prices, ranchers and feeders alternately received windfall gains or suffered losses.

Besides the price system's role as a mechanism of trade, it must also serve as a signal for producers to organize the level and timing of future production. If producers cannot correctly estimate future production levels and resultant prices, they may cause aggregate over- or under-production.

An inherent biological problem in the beef-pork sector is the length of the production process. In beef production it may take from 2½ to 4 years from the time a production decision is made until eventual marketing as a slaughter animal. In pork production, the time required is from 9 months to a year. Short-run adjustments in marketings can be implemented much faster due to the ease of slaughter or of carrying animals to heavier weights. The problem therefore becomes one of establishing long-run production levels to meet expected future demands, and then allowing for short-run adjustments in marketing as the animal reaches the slaughter point, to correct for errors in the production level.

Hopefully, both performances could be made consistently optimal. The inefficient production and marketing performance is a problem for the industry rather than for individual firms. But effective solutions will require critical thinking by all who are interested in the welfare of those working in and served by the beef-pork industry.

References

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