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Estimating Pork Carcass Values

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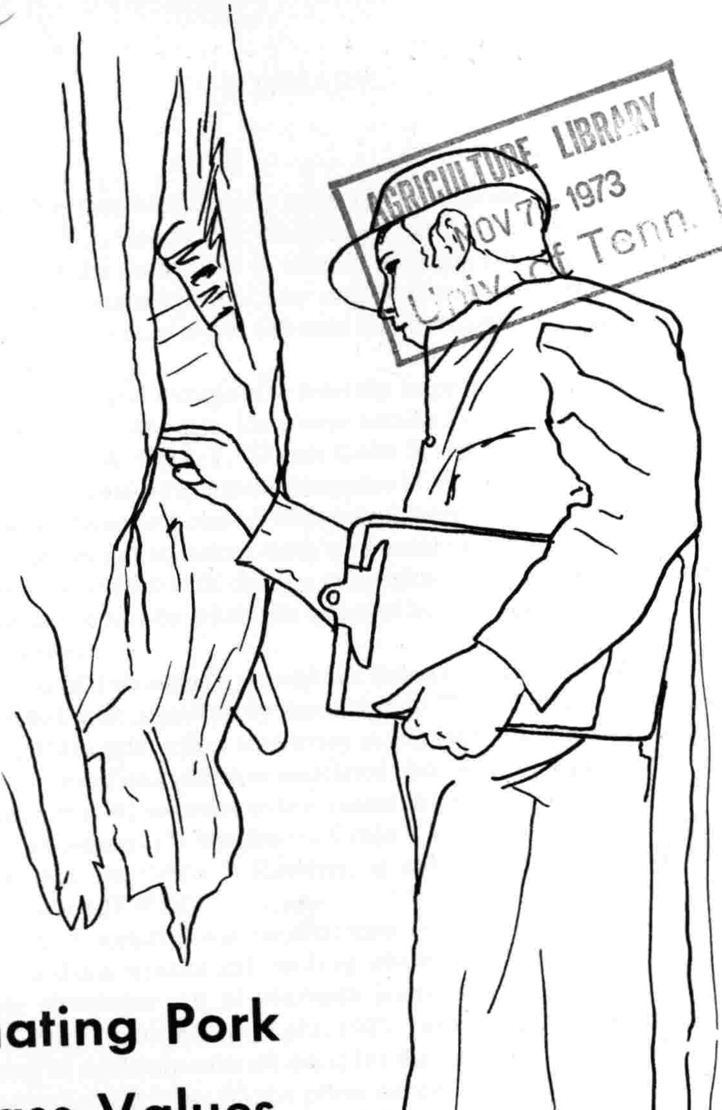

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SUMMARY

The objectives of this study were: (1) to estimate the cutout characteristics of U. S. D. A. Grades 1, 2, and 3 hogs; (2) to determine the variation in gross margins of the packer and to identify variables affecting this margin; and (3) to ascertain relationships that may exist between certain physical characteristics and wholesale values of hot carcasses under different techniques for pricing wholesale cuts.

The facilities and records of a federally inspected meat-packing company were used to collect the data. Data were obtained on 180 animals. Sixty were graded as U. S. D. A. Grade 1, 70 were Grade 2, and 50 were Grade 3. The data represented 18 liveweight and grade categories of 10 animals each.

Wholesale value and cost of each animal were estimated and gross margins calculated. Regression equations using a stepwise procedure were used to identify variables associated with changes in margins and to evaluate the effects of physical characteristics on wholesale values of hot carcasses under four different pricing situations.

Analysis of 180 animals showed the following results: (1) Increases in hot carcass weights were significantly associated ($P \leq .01$) with lower margins for the packer. This could reflect inaccuracy in pricing live animals. (2) Increases in liveweight prices of animals were associated also with decreases in the margins. This suggests that all increases in live animal prices are not passed immediately on to the wholesaler. (3) Margins for Grade 3 animals were significantly lower ($P \leq .10$) than for Grade 1. However, as weights increased within Grade 3, margins increased ($P \leq .10$)

The third objective was to determine the relationships between selected pork carcass characteristics and resulting wholesale values of hot pork carcasses, using four alternative sets of wholesale prices of pork cuts during the study period of May, 1970, through April, 1971: (a) the mean of the average prices for a group of randomly-selected days; (b) the prices on the day of highest liveweight prices for top hogs; (c) the prices on the day of lowest liveweight prices for top hogs; and (d) the mean of the average prices of pork cuts during the entire period. The selected carcass characteristics considered as explanatory factors were hot carcass weight, backfat measures at various points, carcass grade, and muscling scores.

The degree of association (measured by R^2) between carcass characteristics--hot carcass weight, backfat measures at alternative points, grade, and muscling scores--and wholesale carcass values varied from about 0.31 to 0.72. The factor which appeared to explain the largest amount of variation in wholesale pork prices was hot carcass weight. The inclusion of either grade, muscling, or backfat measurement did improve the estimation of wholesale value. However, the inclusion of more than one of these later factors added little to the explanation of wholesale pork values. Further results, also, indicated no advantage from

using more than one backfat measure, and no advantage for either method of backfat measurement.

Since a simple estimating equation containing hot carcass weight and one other factor was as effective in estimating wholesale carcass values as were equations that included a larger number of carcass characteristics, a plant manager who wants to estimate wholesale carcass values should select the model that includes hot carcass weight and the one factor (backfat at the last lumbar vertebra, *or* carcass grade, *or* muscling score) that best fits his plant operating procedures.

The above-selected carcass characteristics appeared to explain a higher proportion of wholesale pork values when the means of all average daily wholesale prices of pork cuts were used to determine wholesale value. This indicated that any of the explanatory variables included do a much better job of predicting carcass values over a longer period of time than for any shorter time interval.

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Warren C. Couvillion, Sr. and Irving Dubov*

INTRODUCTION

The most important reason for continued purchasing of hogs on a liveweight basis is the ability of buyers to estimate accurately carcass values. Additional reasons for liveweight pricing--compared with payment on a carcass weight and grade basis--are organization and structure of the markets, relatively small sizes of lots sold by individual farmers, problems of identifying the origin of the animals after they are slaughtered, and costs incurred by the packer in maintaining the information needed for grade and yield pricing.

Liveweight pricing of slaughter hogs is desirable only if carcass values to the packer are reasonably accurate. Prices received by farmers that are not consistent with the carcass values indicate that liveweight pricing is economically inefficient. Under an inefficient liveweight pricing system, producers have no incentives for producing hogs that yield relatively high value carcasses.

Paying for animals on a grade and yield basis would improve chances for more efficient pricing through all levels of the marketing system. Shepherd, et. al., in 1940, listed these advantages for carcass pricing of slaughter animals: (1) more equitable distribution of payments received by sellers of slaughter hogs; (2) more incentive to raise and market higher grade, higher yield animals; and (3) less incentive to "fill animals before marketing."[1]

Despite long-standing knowledge of these advantages, carcass grade and weight pricing of slaughter hogs has increased rather slowly. In 1970, only 4.8% of all hogs purchased by packers in the United States were bought on a carcass grade and weight basis, and only 0.2% in Tennessee. Use of this procurement method was most prevalent in the heavy producing areas of the North Central States--3.2 million hogs or 8.7% of total packer purchases in 1971.[2]

An increase in carcass weight and grade pricing requires increases in sizes of lots marketed by individual farmers, improved breeding and feeding, and more use of computerized accounting to decrease the relative costs of necessary information for grade and yield pricing.

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[1]Geoffrey Shepherd, Fred J. Beard, and Arval Erikson, **Could Hogs Be Sold by Carcass Weight and Grade in the United States?** (Iowa Experimental Station Research Bulletin 270, January 1940), p. 450.

[2]United States Department of Agriculture, Packers and Stockyard Administration, **Packers and Stockyards Resume, Statistical Issue,** IX, No. 13 (November 1971), pp. 22-23.

OBJECTIVES

The objective of the study was to evaluate differences between the efficiencies of liveweight pricing of slaughter hogs and carcass weight and grade pricing for various weights and grades of hogs and the factors affecting these differences.

The specific objectives were:

1. To estimate the economically significant yield characteristics of United States Department of Agriculture Grades 1, 2, and 3 hogs at different weight intervals.
2. To determine the packer *gross margins*[3] of hogs with different yield characteristics, and to evaluate the importance of factors associated with changes in this margin.
3. To determine the relationships between selected carcass yield characteristics and wholesale values per unit of hot carcass under different situations for prices of wholesale meat cuts.

SOURCES OF DATA

Two sets of data were used in the analysis. The first was taken from first-hand observation of cutout characteristics of a sample of slaughter hogs handled by a large, federally inspected meat-packing company. These data were generated by using the company's records and facilities. The second set of data was from daily wholesale price quotations for selected cuts of pork, reported in the National Provisioner Daily Market Service sheets.[4]

Deficiencies in the data included: (1) some measures--such as muscling scores and U. S. D. A. grades assigned to individual animals--had a potential for reflecting the subjective opinions of the individuals assigning the scores; (2) liveweights of the individual animals in the carcass study could not be recorded directly, and had to be estimated from hot carcass weights on the basis of conversion tables;[5] and (3) observations for each animal could be made on only six major cuts (loins, hams, picnics, butts, bellies, and ribs). Thus, it was necessary to weigh parts of each carcass as a group. The nature of the production line and the amount of time allotted by the packing house management for halting the

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[3]Gross Margin per Hundredweight = $\frac{\text{Wholesale Value-Acquisition Cost}}{\text{Carcass Weight in Hundredweight}}$ where acquisition cost is the cost of the live animals delivered to the plant. This cost does not include costs associated with holding or slaughtering. Wholesale value is the estimated value of the carcass.

[4]The National Provisioner Daily Market Service, Series AV and AW, 15 West Huron Street, Chicago, Illinois.

[5]Based on standards shown in Appendix A.

line to assemble information limited the data that could be obtained. These same considerations limited the number of animals that could be selected for evaluation in each weight and grade category.

Finally, proportional samples were not used in selecting animals from which to derive cutout data. Operating procedures and policies in the plant prevented proportional sampling for each weight and grade category. Thus, any inferences may be limited to the extent that sample proportions differed from those in the population.

PHYSICAL CUTOUT DATA

The first objective was to estimate the physical cutout characteristics of U. S. D. A. Grades 1, 2, and 3 hogs at selected weight intervals. To accomplish this, data from a sample of 180 hogs were obtained in a federally inspected meat-packing plant during the period of September, 1970, through June, 1971. Animals were selected to represent each particular weight range. Appendix A shows the weight ranges and grades. Eighteen categories were covered. Each contained data for 10 animals for a 20-pound range based on liveweight. Animals included in the study were selected at random by the company grader from among those coming off the kill line.

Animals selected were marked so that individual weights of loins, hams, ribs, picnics, butts, and bellies could be obtained for each carcass. The remaining cuts were weighed as a group. In addition, individual measurements were recorded for: (1) hot carcass weight, (2) muscling, (3) length, (4) supplier, (5) sex, and (6) backfat thickness at the first, fifth, and last rib and at the last lumbar vertebra.

Operating procedures in the packing plant prevented the recording of the liveweight of the animals for which carcass measurements were taken. Therefore, the liveweights used in the analysis were estimated from the plant's standardized conversion factors, which are shown in Appendix A.

In several instances, sample animals were missing parts, such as front feet or jowls. When this occurred, the weights of these parts were estimated and added to the hot carcass weight. This was done because missing parts were assumed to result from assembly line problems and were, therefore, unrelated to the price relations under study.

The selected animals were handled under the regular assembly line procedure followed by the packer. Cutting was done at the beginning of each day's operation. After all test animals were cut, the assembly line was stopped. All of the cuts were then weighed with data recorded to the nearest tenth of a pound.

The percentage of hot carcass weight that should be assigned to each of its components was calculated. The hot carcass weight was based on the entire carcass dressed packer style (split down the back into two sides, jowls attached, but with head, ham facings, leaf fat, and kidneys removed). Weights that fell at a breaking point were assigned to the lighter category; e.g., a 12.0 pound ham was assigned to the 10-12 pound category.

Of the 180 carcasses evaluated in this part of the study, 60 (33.3%) were U. S. D. A. Grade 1, 70 (38.89%) were Grade 2, and 50 (27.78%) were Grade 3.

An employee of the company in whose plant the data was taken assigned a muscling score to each carcass. The results were as follows: very thick muscling--18; thick muscling--51; moderately thick muscling--79; and slightly thin muscling--32.

The average weight of the four lean cuts as a percentage of hot carcass weight and other observed variables are shown in Table 1.

FACTORS AFFECTING PACKER GROSS MARGINS[6]

Procedure

The second objective was to determine margins for the 180 animals selected in the first phase of this study and to measure the importance of factors associated with differences in these margins. Therefore, the cutout data derived in reaching Objective 1, invoices from suppliers, and the National Provisioner Daily Market Service price lists on dates on which animals were purchased, were used to calculate margins for these 180 animals.

The value of the offal was not included in the wholesale value of the animals because it was removed before cutting and weighing could begin. Also, costs associated with holding and slaughtering were excluded in calculating the costs of the individual animals because of unavailability of data.

The packer gross margin calculated on each animal was used as the dependent variable in the relationships examined under this objective, and was assumed to be a proxy for the level of profitability and an indicator of the accuracy of buying practices. Data availability for estimating cost and wholesale values of animals also influenced the selection of this particular dependent variable.

Least squares multiple regression analysis was used to fit a linear equation of the following form to the data:

[6]See footnote 3.

Table 1. Means and Standard Deviations of Weight, Backfat, Length, and Percent Lean Cuts for 180 Hogs in the Sample

		All Hogs in Sample, N=180		Grade 1 Hogs N=60		Grade 2 Hogs N=70		Grade 3 Hogs N=50	
Characteristic	Unit	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Hot carcass weight	Pounds	168.1	26.42	162.5	25.65	169.1	29.62	173.5	21.28
Average backfat[a]	Inches	1.62	.26	1.37	.19	1.65	.16	1.87	.15
Backfat at first rib	Inches	1.98	.32	1.70	.21	2.03	.23	2.25	.25
Backfat at fifth rib	Inches	1.74	.29	1.48	.21	1.77	.22	2.00	.20
Backfat at last rib	Inches	1.35	.25	1.15	.22	1.36	.20	1.55	.18
Backfat at last lumbar vertebra	Inches	1.52	.33	1.23	.25	1.56	.22	1.81	.24
Length	Inches	30.14	1.49	30.45	1.49	30.08	1.56	29.84	1.37
Percent lean cuts[b]	Percent	51.13	2.49	54.75	1.48	50.14	1.02	48.19	1.08

[a]Mean of backfat measurements taken at the first and last ribs and at the last lumbar vertebra.

[b]Combined chilled weight of hams, loins, butts, and picnics, expressed as a percent of hot carcass weight.

$$X_1 = b_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9$$

+ e where:

X_1 = gross margins in dollars per hundredweight
X_2 = hot carcass weight in pounds
X_3 = price per hundredweight on a liveweight basis in dollars
X_4 = one, if Grade 1 and zero otherwise
X_5 = one, if Grade 2 and zero otherwise
X_6 = one, if Grade 3 and zero otherwise
$X_7 = X_2 . X_4$ if Grade 1 and zero otherwise
$X_8 = X_2 . X_5$ if Grade 2 and zero otherwise
$X_9 = X_2 . X_6$ if Grade 3 and zero otherwise
e = error term

Zero-one dummy variables[7] were used to represent the effects of grade on gross margins; that is, whether gross margins did differ by grades, and whether the relation between hot carcass weights and gross margins differed by grades.

Results

Table 2 shows the values estimated for the coefficients of the multiple regression equation. This equation explained around 60% of the variation in the gross margins for the original 180 animals included in the study.

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[7]Daniel B. Suits, "Use of Dummy Variables in Regression Equations," **Journal of the American Statistical Association,** LII, No. 280 (December, 1957), pp. 548-551. To avoid the computational difficulty of "singularity," the variables for Grade 1 were omitted from the calculations.

Table 2. Coefficients of Equation Relating Hot Carcass Weights and Grades to Gross Margins in Dollars Per Hundredweight

Coefficient	Estimated Value	Standard Errors	Level of Significance
b_1	17.257	–	–
b_2	–.037	.006	.01
b_3	–.508	.054	.01
b_4	a	–	–
b_5	–1.556	1.170	NS[b]
b_6	–2.726	1.548	.10
b_7	a	–	–
b_8	+.010	.007	NS[b]
b_9	+.017	.009	.10
R^2	.601	–	–
Se	1.075	–	–

[a]Omitted to avoid singularity.

[b]Not significant.

The major conclusions from the results were: The coefficient for hot carcass weight (b_2) and liveweight price (b_3) were both negative and significant at the .01 level. This implied that the higher the liveweight price, the lower the gross margin. It meant also that gross margins were lower for heavier animals. The value of the coefficient (b_6) for the variable that registered the effect of Grade 3 on gross margins was both negative and significant at the .10 level: thus, gross margins for Grade 3 were significantly lower than for Grade 1. Also, the value of the coefficient (b_9) of the variable that showed whether the relation between hot carcass weights and gross margins was different for Grade 3 was positive and significant at the .10 level. This, in turn, implied that for Grade 3, gross margins were larger as weights increased.

FACTORS ASSOCIATED WITH WHOLESALE CARCASS VALUES

Procedure

Most systems of carcass weight and grade pricing used by packers include schedules of premiums and discounts to take account of differences in wholesale values attributable to physical carcass characteristics. These differences should be reflected accurately under different market situations for both wholesale cuts of meat and live slaughter animals. And so, this part of the analysis was concerned with the efficiency of carcass weight and grade pricing by packers. It sought to determine relationships between selected carcass yield characteristics and resulting wholesale values per hundredweight of hot carcass under four alternative sets of wholesale prices of pork cuts during the study period:

Set 1 – The means of the average wholesale prices of pork cuts reported for two days randomly selected for each month of the period May, 1970, through April, 1971.

Set 2 – Wholesale prices of pork cuts on the day on which the top liveweight price in Peoria, Illinois, was highest during the period covered by the study.

Set 3 – Wholesale prices of pork cuts on the day on which the top liveweight price in Peoria, Illinois, was lowest during the period covered by the study.

Set 4 – Average wholesale prices of pork cuts for all days on which animals were selected for inclusion in this study.

Linear multiple regression was used to evaluate relationships among the following variables.

Dependent Variables

X_1 = wholesale value per hundredweight of hot carcass based on Set 1 prices

X_2 = wholesale value per hundredweight of hot carcass based on Set 2 prices

X_3 = wholesale value per hundredweight of hot carcass based on Set 3 prices

X_4 = wholesale value per hundredweight of hot carcass based on Set 4 prices

Independent Variables

X_5 = hot carcass weight in pounds

X_6 = average backfat in inches

X_7 = backfat in inches taken at the fifth rib

X_8 = backfat in inches taken at the last lumbar vertebra
X_9 = one, if Grade 1 and zero otherwise
X_{10} = one, if Grade 2 and zero otherwise
X_{11} = one, if Grade 3 and zero otherwise
X_{12} = one, if very thick muscling and zero otherwise
X_{13} = one, if thick muscling and zero otherwise
X_{14} = one, if moderately thick muscling and zero otherwise
X_{15} = one, if slightly thin muscling and zero otherwise

Results

Each of the four dependent variables listed was related to the same nine sets of independent variables. Table 3 shows the coefficients derived for each set of nine equations for each of four alternative dependent variables. The F ratio of the regressions were significant at the .01 level for all the equations in all four sets.

The degree of association (measured by R^2) between grade, muscling, and various backfat measures on the one hand and wholesale carcass values on the other varied from about 0.31 to 0.72. The lowest R^2 was obtained when wholesale values based on Set 1 and Set 2 prices were used as independent variables; the highest was obtained when wholesale values were based on Set 4 prices. Other important results were these:

- Hot carcass weights were always inversely related to wholesale carcass values and significantly so.
- Average backfat thicknesses, regardless of where taken, were always significantly related (inversely) in all except one equation.
- Average backfat thicknesses, regardless of where measured, were not significantly related to wholesale carcass values if grade and/or muscling were included in the equations.
- Grades were not significantly related when muscling scores were included as factors in the equations.
- Grades were significantly related when hot carcass weight was the only additional independent variable.
- Muscling scores were significantly related whenever they were included in any equations.

Interpretation

The R^2 values indicate that the method of pricing wholesale cuts in order to arrive at wholesale carcass values is more important in explaining variation in wholesale values than were any of the other factors used as explanatory variables. The highest R^2 values for all equations were obtained when wholesale values were based on Set 4 prices. This indicated that any of the explanatory variables

Table 3. Coefficients of Equations Relating Carcass Characteristics to Wholesale Carcass Values, Using Four Alternative Procedures for Pricing Wholesale Pork Cuts

Equation Number	Dependent Variable	b_0	b_5	b_6	b_7	b_8	b_9	b_{10}	b_{11}	b_{12}	b_{13}	b_{14}	b_{15}	R^2
1	X_1	33.695	-.0154**	- .7057**	--	--	--	--	--	--	--	--	--	.3599
	X_2	34.927	-.0118**	-1.065 **	--	--	--	--	--	--	--	--	--	.3374
	X_3	28.997	-.0141**	- .8557**	--	--	--	--	--	--	--	--	--	.4987
	X_4	33.680	-.0293**	- .7463**	--	--	--	--	--	--	--	--	--	.7061
2	X_1	33.467	-.0166**	--	--	-.4293**	--	--	--	--	--	--	--	.3475
	X_2	34.653	-.0138**	--	--	-.7300**	--	--	--	--	--	--	--	.3248
	X_3	28.767	-.0158**	--	--	-.5751**	--	--	--	--	--	--	--	.4849
	X_4	33.482	-.0308**	--	--	-.5035**	--	--	--	--	--	--	--	.7012
3	X_1	33.554	-.0157**	--	-.5102**	--	--	--	--	--	--	--	--	.3478
	X_2	34.709	-.0128**	--	-.7660**	--	--	--	--	--	--	--	--	.3104
	X_3	28.834	-.0149**	--	-.6288**	--	--	--	--	--	--	--	--	.4763
	X_4	33.572	-.0298**	--	-.5860**	--	--	--	--	--	--	--	--	.7006
4	X_1	33.941	-.0181**	-.2087	--	--	o/s	.1446	-.0230	o/s	-.5257**	- .7044**	- .6699**	.3967
	X_2	35.113	-.0165**	-.2873	--	--	o/s	.2746	.0144	o/s	-.5655**	-1.0019**	- .9269**	.4062
	X_3	29.197	-.0177**	-.2331	--	--	o/s	.0445	.0635	o/s	-.5448**	- .7468**	- .7349**	.5580
	X_4	33.840	-.0317**	-.3842	--	--	o/s	.1409	.0427	o/s	-.3335*	- .5310*	- .5224*	.7185
5	X_1	33.786	-.0190**	--	--	.0079	o/s	.1031	-.1072	o/s	-.5368**	- .7330**	- .6941**	.3955
	X_2	35.002	-.0171**	--	--	-.1435	o/s	.2487	-.0317	o/s	-.5660*	-1.0096**	- .9370**	.4062
	X_3	29.095	-.0182**	--	--	-.0997	o/s	.0200	-.1085	o/s	-.5468**	- .7565**	- .7457**	.5568
	X_4	33.686	-.0325**	--	--	-.1848	o/s	.1048	-.0221	o/s	-.3349*	- .5428*	- .5370*	.7173

6	X_1	33.899	-.0185**	--	-.1242	--	o/s	.1343	-.0528	o/s	-.5385**	-.7282**	-.6815**	.3962
	X_2	35.036	-.0170**	--	-.1492	--	o/s	.2552	-.0355	o/s	-.5820**	-1.035 **	-.0450**	.4050
	X_3	29.148	-.0180**	--	-.1377	--	o/s	.0327	-.0973	o/s	-.5590**	-.7733**	-.7481**	.5571
	X_4	33.816	-.0320**	--	-.2917	--	o/s	.1369	.0136	o/s	-.3583*	-.5731**	-.5381**	.7184
7	X_1	33.116	-.0172**	--	--	--	o/s	-.1986**	-.4385**	--	--	--	--	.3622
	X_2	34.045	-.0150**	--	--	--	o/s	-.2800**	-.6683**	--	--	--	--	.3441
	X_3	28.321	-.0167**	--	--	--	o/s	-.3291**	-.5304**	--	--	--	--	.5061
	X_4	33.069	-.0317**	--	--	--	o/s	-.2027*	-.4237*	--	--	--	--	.7030
8	X_1	33.782	-.0189**	--	--	--	--	--	--	o/s	-.5046**	-.6947**	-.7639**	.3878
	X_2	34.858	-.0173**	--	--	--	--	---	--	o/s	-.5116**	-.9247**	-1.055 **	.3849
	X_3	29.066	-.0188**	--	--	--	--	--	--	o/s	-.5590**	-.8243**	-.8911**	.5509
	X_4	33.568	-.0331**	--	--	--	--	--	--	o/s	-.3329*	-.5691**	-.6437**	.7125
9	X_1	33.791	-.0189**	--	--	--	o/s	.1047	-.1036	o/s	-.5360**	-.7314**	-.6930**	.3955
	X_2	34.907	-.0176**	--	--	--	o/s	.2197	-.0966	o/s	-.5797**	-1.0390**	-.9587**	.4040
	X_3	29.029	-.0185**	--	--	--	o/s	-.0001	-.1536	o/s	-.5563**	-.7769**	-.7607**	.5559
	X_4	33.564	-.0331**	--	--	--	o/s	-.1059	-.3525[a]	o/s	-.3525**	-.5807*	-.5649*	.7158

[a]Significant at .10 level.
*Significant at .05 level.
**Significant at .01 level.
o/s = omitted to avoid singularity.

included did a much better job of predicting over a longer period of time than for some short selected time interval.

Changing relations among wholesale prices of individual cuts, in response to seasonal changes in retail demand, may explain the lower R^2 coefficients when wholesale values were based on prices covering short periods of time. Qualitative factors (such as backfat measures, grade, or muscling score) may not be able to predict or explain wholesale values at any particular point in time, but over longer periods they may be more effective.

Finally, it appeared that backfat measures and muscling were intercorrelated with each other and with carcass grade. Also, the simplest estimating equations (1, 2, 3, 7, and 8) were as effective in estimating wholesale carcass values as were equations that included more carcass characteristics at a time. The conclusion is that a plant manager who wants to estimate wholesale carcass values should select the simplest equation that includes the one factor besides carcass weight (backfat *or* carcass grade *or* muscling score) that is best suited to his plant's operating procedures.

APPENDIX A

Table 4. Standards for Shrink and Dressing Percent[a]

Liveweight		171–190	191–210	211–230	231–250	251–270	271–290	291–330
USDA	Dressing percent	68.5	69.5	70.0	70.5	71.0	71.5	
No.	Hot carcass weight	117–131	132–146	147–161	162–177	178–192	193–208	
1	Shrink	2.80	2.70	2.60	2.55	2.45	2.35	
USDA	Dressing percent	68.5	69.5	70.0	70.5	71.0	71.5	71.5
No.	Hot carcass weight	117–131	132–146	147–161	162–177	178–192	193–207	208–222
2	Shrink	2.45	2.40	2.35	2.25	2.15	2.10	2.05
USDA	Dressing percent		71.5	72.5	72.0	72.5	73.0	
No.	Hot carcass weight		133–150	151–165	166–181	172–196	197–212	
3	Shrink		2.10	2.05	2.00	1.95	1.90	

[a]Based on data gathered in tests run from April, 1965, through March, 1969, at plant where data were gathered.

(2.1M/6-73)