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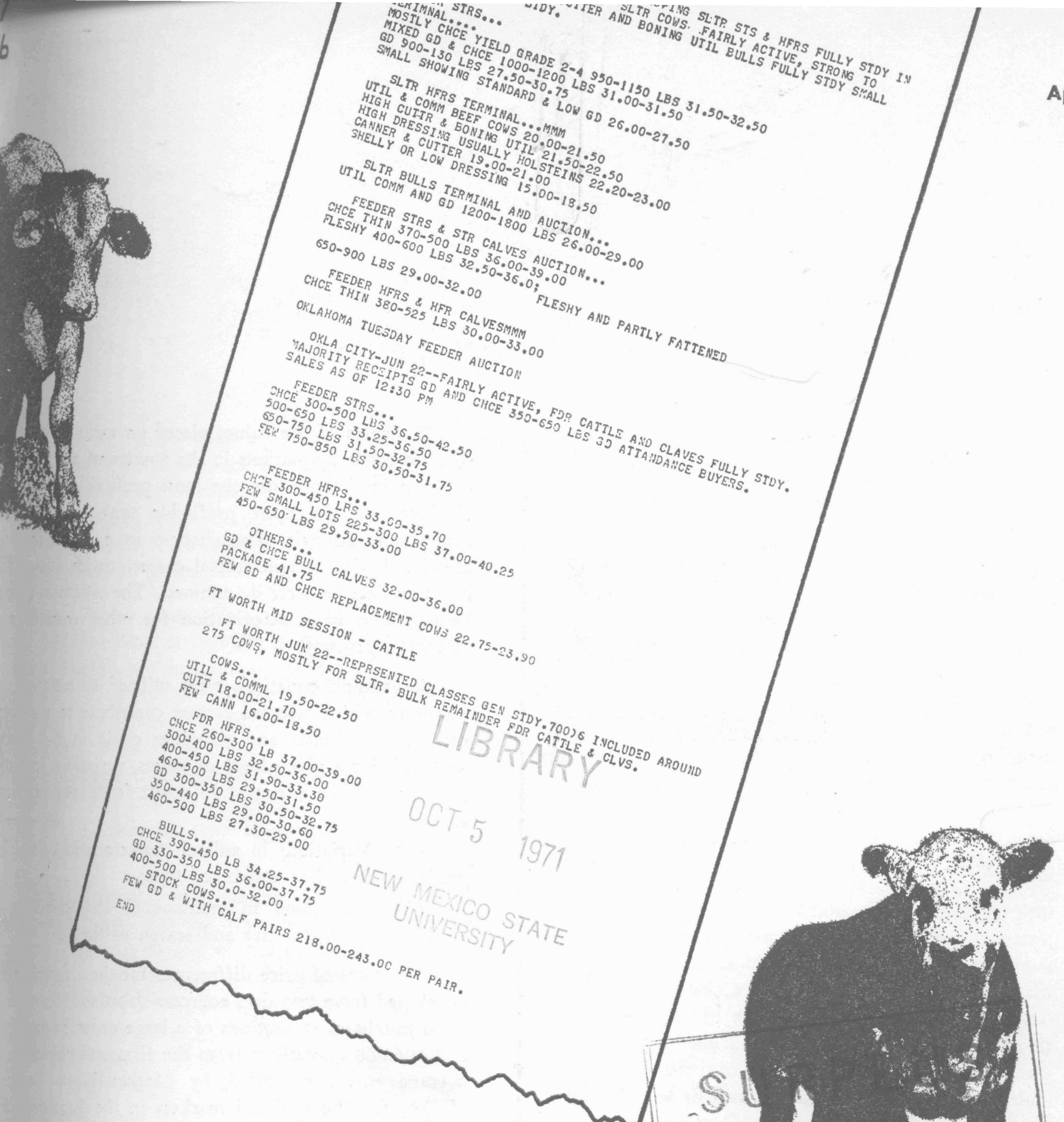
April 1971


...STRS... SLTR COWS. FAIRLY ACTIVE, STRONG TO
...ERMINAL... ...TTER AND BONING UTIL BULLS FULLY STDY SMALL
...STDY. ...PING SLTR STS & HFRS FULLY STDY IN
MOSTLY CHCE YIELD GRADE 2-4 950-1150 LBS 31.50-32.50
MIXED GD & CHCE 1000-1200 LBS 31.00-31.50
GD 900-130 LBS 27.50-30.75
SMALL SHOWING STANDARD & LOW GD 26.00-27.50
SLTR HFRS TERMINAL...MMM
UTIL & COMM BEEF COWS 20.00-21.50
HIGH CUTTR & BONING UTIL 21.50-22.50
HIGH DRESSING USUALLY HOLSTEINS 22.20-23.00
CANNER & CUTTER 19.00-21.00
SHELLY OR LOW DRESSING 15.00-18.50
SLTR BULLS TERMINAL AND AUCTION...
UTIL COMM AND GD 1200-1800 LBS 26.00-29.00
FEEDER STRS & STR CALVES AUCTION...
CHCE THIN 370-500 LBS 36.00-39.00
FLESHY 400-600 LBS 32.50-36.0; FLESHY AND PARTLY FATTENED
650-900 LBS 29.00-32.00
FEEDER HFRS & HFR CALVESMMM
CHCE THIN 380-525 LBS 30.00-33.00
OKLAHOMA TUESDAY FEEDER AUCTION
OKLA CITY-JUN 22--FAIRLY ACTIVE, FDR CATTLE AND CLAVES FULLY STDY.
MAJORITY RECEIPTS GD AND CHCE 350-650 LBS 30 ATTANDANCE BUYERS.
SALES AS OF 12:30 PM
FEEDER STRS...
CHCE 300-500 LBS 36.50-42.50
500-650 LBS 33.25-36.50
650-750 LBS 31.50-32.75
FEW 750-850 LBS 30.50-31.75
FEEDER HFRS...
CHCE 300-450 LBS 33.00-35.70
FEW SMALL LOTS 225-300 LBS 37.00-40.25
450-650 LBS 29.50-33.00
OTHERS...
GD & CHCE BULL CALVES 32.00-36.00
PACKAGE 41.75
FEW GD AND CHCE REPLACEMENT COWS 22.75-23.90
FT WORTH MID SESSION - CATTLE
FT WORTH JUN 22--REPRSENTED CLASSES GEN STDY.700)6 INCLUDED AROUND
275 COWS, MOSTLY FOR SLTR. BULK REMAINDER FDR CATTLE & CLVS.
COWS...
UTIL & COMML 19.50-22.50
CUTT 18.00-21.70
FEW CANN 16.00-18.50
FDR HFRS...
CHCE 260-300 LB 37.00-39.00
300-400 LBS 32.50-36.00
400-450 LBS 31.90-33.30
460-500 LBS 29.50-31.50
GD 300-350 LBS 30.50-32.75
350-440 LBS 29.00-30.60
460-500 LBS 27.30-29.00
BULLS...
CHCE 390-450 LB 34.25-37.75
GD 330-350 LBS 36.00-37.75
400-500 LBS 30.0-32.00
STOCK COWS...
FEW GD & WITH CALF PAIRS 218.00-243.00 PER PAIR.
END

actors Affecting Price Differences of Cattle n the Southwest

XAS A&M UNIVERSITY
E TEXAS AGRICULTURAL EXPERIMENT STATION
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Summary and Conclusions

Estimates of the values placed on various characteristics of cattle by markets in the Southwest are provided to assist in determining the most profitable animals to produce and the most profitable time and place to market the animals. The changes in price differences associated with certain animal characteristics during the past two decades were determined. The estimates should be useful as basic information for other research and extension projects.

Regression equations were utilized to estimate the extent to which selected factors contribute to the price variation of feeder and slaughter cattle in the Southwest. Under a given level of prices, variations in cattle prices would be expected to result from two principal sources:

(1) Variations in animal characteristics — weight, grade, market class and breed type;

(2) Variations in non-animal characteristics — market location, lot size and season of the year.

Estimates of price differences for these factors were developed from two data sources: (a) the 1968 invoices from purchases at auctions of a large order buying firm and 1966-68 quotations from the firm and (b) monthly average prices compiled by Market News Service, USDA, for the regional markets in the Southwest for 1964-68.

Feeder Cattle

Order buyer grades of Okie #1, Okie #2 and Okie #3 were used with the order buyer data. These roughly correspond to USDA grades of Choice, Good and Standard for feeder calves and should not affect the estimates of price difference associated with the nongrade characteristics.[1]

Prices differed by about 5 percent between Okie #1 and #2 and between Okie #2 and #3 grades. Prices differed about 12 percent between Okie steers and heifers of the same weight and grade. Okie feeder

[1]For this study, an Okie is defined as an animal of mixed breeding with some evidence of dairy or Brahman breeding. The lower the proportion of English beef breeding the higher the number and the lower the Okie grade.

marketed in the fourth quarter brought about 3 percent less than those sold in the second and third quarters of the year during 1966-68. Between the weights of 350 to 500 pounds, price declined at a constant rate. A 50-pound increase in weight of a feeder reduced the price per pound by 3 percent.

Market News Service data included all types of feeder cattle marketed at regional markets in the Southwest, but English beef breeds were predominant. There was about a 10-percent price difference between Choice and Good and between Good and Standard. Weight differences were about the same as for the Okie data. Estimates of price differences between steers and heifers (10 percent) and between the third and fourth quarter of the year (2 percent) were slightly less for Market News data.

Price differences due to market location were small and generally less than the transfer cost between the markets. This satisfies one of the necessary conditions of a highly competitive market. Generally, the cow-calf areas had the lowest prices and feeding areas the highest. Minor exceptions may be due to errors in measurement.

Slaughter Cattle

During 1964-68, price difference due to grades for slaughter cattle was about $1.50 per 100 pounds of Choice over Good steers and about $1.30 for Choice over Good heifers. Price difference due to varying weights for the same grade was small; for example, price was about the same for slaughter steers with weights varying from 850 to 1,150 pounds.

Price difference due to location was small and generally less than the transfer cost between the markets. The ranking of average prices at different markets from high to low did not reflect expectations concerning surplus and deficit areas for slaughter cattle in all cases; consequently, the results must be considered as tentative.

Prices of steers averaged 62 cents per 100 pounds above the heifers of the same grade; prices the first quarter of the year were lowest, those the third quarter highest.

Trends

Prices between slaughter cattle grades narrowed over the period 1955-68. If the trend line is projected to 1972, the price difference between Prime and Choice is essentially eliminated. On the other hand, price differences between feeder grades increased slightly during the same period. Some of the trend may be due to redefinition of grades, but most appears to be due to greater efficiency in cattle feeding and to more accurate reflection by the market of the relative value of specific animal quality.

Implications

For feeder cattle production, these findings provide useful guides on returns in the breeding program; for example, an index of total value per head suggests the amount of grade a producer can sacrifice to obtain more rapid gain. In a cross breeding program, a producer apparently can introduce some dairy, Brahman or other cattle breeds into his herd to produce higher weaning weights. If this cross breeding results in a reduction from Choice to Good grade feeders or from Good to Standard, animals must gain at least 50 pounds in weaning weight with no additional feed cost to make the practice pay. If the grade drops from Choice to Standard, then animals must increase weaning weights to about 100 pounds before the change in the breeding program is profitable. If the higher weaning weights have extra costs associated with cow maintenance or creep feeding, it becomes more difficult to overcome the discount due to loss in grade or the discount due to heavier weights. In other words, if a cross breeding program does not maintain the same grade level, serious questions may be raised as to its profit potential.

For feedlot operators, these findings imply that they can afford to pay $12 to $18 per head more for a feeder one grade higher assuming the same weight and feeding efficiency potential.

Contents

Factors Affecting Price Differences of Cattle in the Southwest

J. B. James and D. E. Farris*

Concepts are changing as to the kinds of beef animals needed for feedlot operations and the kinds of animals desired by packers and retailers. Ranchers, farmers, feedlot operators, wholesalers, packers and retailers are becoming more aware of the importance of weaning weights, daily weight gains, breed characteristics, feed efficiency, grades, carcass yields and yields of retail cuts. Therefore, the industry and researchers have a need for more information concerning the value the market places on various animal characteristics, the geographical location of markets and the seasonal availability of cattle. It is inefficient for each operator or researcher in the industry to make his own price analysis as an input for decisions involving many other relationships. Furthermore, there are gaps in most data series. This study attempted to provide more extensive, complete and, hopefully, better estimates of price differences due to certain factors than are now available. These estimates should assist the industry in determining the most profitable animals to produce and the most profitable time and place to market the animals. Analyses also were undertaken to determine whether price differences associated with certain animal characteristics have changed during the past two decades.

Purpose of Study

The specific objectives of this study were

1) To describe the relationship between the prices of feeder cattle sold at auction markets in the Southwest and feeder cattle characteristics. The feeder cattle characteristics considered were the grade, weight, type and class of the animal. The influences of other factors, such as the lot size of the sale, location of markets and the season of the year on feeder cattle prices, were also analyzed;

2) To analyze the price differences among feeder cattle and slaughter cattle sold at regional markets in the Southwest. The influences of grade, weight, class, season and market location on market price were examined; and

3) To determine whether the price differences associated with the market class, weight and grade of feeder cattle and of slaughter cattle have changed during the last two decades.

Method of Analysis

For Objectives 1 and 2, linear regression equations were utilized to estimate the extent to which selected factors contribute to the price variation of feeder and slaughter cattle in the Southwest. Under a given level of cattle prices, variations in cattle prices would be expected to result from two principal sources:

(1) Variations in animal characteristics — weight, grade, market class and breed type;

(2) Variations in non-animal characteristics — market location, lot size and the year and the season of the year in which the transaction occurs.

The effects of these factors on the price of feeder and slaughter cattle are illustrated by the following general statistical model:

$$P = B_0 + G_i + B_1X_1 + B_2X_2 + B_3X_3 + ML_j + B_4X_4 + Q_k + Yr_L + E$$

Where

P = the price in dollars per hundredweight,
B_i = constants,
G_i = grade,
X_1 = weight,
X_2 = market class (sex),
X_3 = breed,
ML_j = market location,
X_4 = lot size,
Q_k = season,
Yr_L = year,
E = error term.

*Respectively, former research assistant and associate professor, Department of Agricultural Economics and Rural Sociology.

Certain of the independent variables in this model, such as weight and the lot size, can take values over some continuous range. Other independent variables, such as grade or market location, are not easily measured on a continuous scale. Therefore, it was necessary to assign these variables numerical values to introduce them into the model. Such variables are commonly called dummy variables. Suits describes the procedure for the use of dummy variables in regression equations (8). James gives more detail on the statistical analysis (5).

For Objective 3, linear regression techniques were used to estimate the time trend in price differences associated with the animal characteristics of weight, grade and market class in both feeder and slaughter cattle.

Price Differences of Feeder Cattle

In any price analysis, the usefulness and limitations of the estimates are dependent on the source and form of data. Prices of feeder cattle were developed from several sources and time periods, and each set of data yields slightly different estimates. Feeder cattle prices and related information were obtained from the following sources:

(1) Auction market invoices of Okie feeder cattle purchased by a large order buying firm in 1968 were expected to provide the most precise measure of price differences because a specific description of each lot and the exact price paid for each lot were available. Furthermore, 1968 was a year of relatively stable cattle prices when the market would be expected to transmit accurate measures of the value of different characteristics;

(2) Order buyer price quotations for the 1966-68 period were used for estimates of additional variables not included in the data from invoices. The longer period was one of relatively stable, but slightly rising prices;

(3) Prices compiled by the Market News Service provided more extensive coverage, but the estimates of price differences due to different characteristics were probably less precise than those of the other two sources. These data were compiled by averaging price ranges quoted daily by grades and weight groupings and, consequently, had less precision than more narrowly defined quotations or specific sales records. Monthly averages of daily prices for the period 1964-68 were used.

Analyses of Order Buyer Auction Data

Data for the livestock auction price difference analyses were obtained from the records of an order buying firm located in Fort Worth. The firm's staff of buyers purchase feeder cattle from many country livestock auctions, primarily from those located within a 250-mile radius of Fort Worth. However, the firm also purchases cattle from more distant auctions and on the Fort Worth market. It is assumed that this firm is a competitive buyer on each market from which it buys feeder calves; consequently, the prices it pays are expected to reflect the market for the specific kind of cattle under consideration. Although the firm deals primarily in Okie type calves it purchased English breed cattle for its customers. The firm differentiates cattle quality with its own numerical grading system. Accordingly, Okie #1, Okie #2 and Okie #3 grades correspond to the USDA grades of Choice, Good and Standard, respectively.

Data for certain of the analyses were obtained directly from the firm's livestock auction purchase invoices. The invoices covered selected months of a 1-year period, 1968, and represented a sample of auctions in each cardinal point of the compass from Fort Worth. Other data originating from auctions were obtained from feeder cattle price quotations issued by the firm. These prices are the approximate prices (fob Fort Worth) charged feedlot customers for given grade-weight categories of feeder cattle. The price quotations also differentiate between the breed and the sex of cattle within a particular grade-weight category.

The price quotations are approximate in that they are the firm's best estimates of current prices. The firm's normal procedure is to purchase cattle for feedlot operators at cost plus a charge for the performance of the buying and assembly function. Revised price quotation sheets are mailed to potential purchasers of feeder calves when significant changes occur in the prices the firm pays for cattle on the market from which it purchases. Quotation sheets covering a 3-year period, 1966-68, were obtained for analysis.

Four different analyses were conducted using order buyer data, each designed to develop estimates for different factors (Table 1). The 1968 data on Okie #1 and Okie #2 steers provide reliable estimates on the effect of area and weight on prices and probably yield the best estimates on the difference between Okie #1 and Okie #2 steers because it covers a period of relatively stable prices and a rather uniform group of cattle.

The data from order buyer quotations 1966-68 were used to develop estimates of price differences between seasons or quarters of the year, three Okie grades Choice steers and Choice heifers and English beef breeds and Okies.

The average difference between an Okie #1 and Okie #2 steer was $1.35 per hundredweight, and an increase in weight of 50 pounds decreased the average price paid by $0.79. The weight effect appeared to be linear over the range of 300- to 500-pound feeder

Over the 1966-68 period when average prices were slightly lower than in 1968, the effects of grade and weight were also lower. Number 3 Okies were priced $1.30 per hundredweight below #2 (Table 1).

Steer prices averaged $3.66 per 100 pounds above the same quality of heifers (Table 1), and Good and Choice English beef breed steers averaged $2.43 above Okies of the same grades and weights (Table 1).

TABLE 1. ESTIMATED DEVIATIONS FROM SPECIFIED FACTORS IN PRICES PAID FOR FEEDER CATTLE AT AUCTIONS IN TEXAS[1]

Factor	"Okie" steers[2] 1968	"Okie" steers[3] 1966-68	Okie #1 Steers & heifers[3] 1966-68	Good & Choice steers 1966-68
	— — — — Dollars per cwt — — — —			
Grade[4]				
Okie #1	1.35	1.17		
Okie #2	0.00	0.00		
Okie #3		—1.30		
Breed				
English beef breeds				2.43
"Okie"[5]				0.00
Sex				
Steer			3.66	
Heifer			0.00	
Weight				
300 pounds	2.37	1.85	1.94	2.79
350 pounds	1.58	1.23	1.29	1.67
400 pounds	0.79	0.61	0.64	0.74
450 pounds	0.00	0.00	0.00	0.00
500 pounds	—0.79	—0.62	—0.65	
Season				
First quarter		0.80	0.75	0.60
Second quarter		1.08	1.31	1.54
Third quarter		1.09	1.36	1.46
Fourth quarter		0.00	0.00	0.00
Areas of Texas[6]				
Eastern[7]	—0.20			
Northern[8]	0.00			
Southern[9]	0.25			
Western[10]	—0.18			

[1]Includes some auctions in western Arkansas, western Louisiana and southern Oklahoma.
[2]Prices and other information obtained from order buyer invoices.
[3]Prices and other information obtained from order buyer price quotations.
[4]Grades used by order buyer were #1, #2, and #3 Okie, which roughly correspond to USDA grade of Choice, Good and medium.
[5]Mixed breeds usually having some dairy or Brahman breeding.
[6]Area coefficients adjusted by mean distance from Fort Worth.
[7]Includes western Louisiana.
[8]Includes southern Oklahoma.
[9]Does not include extreme South Texas.
[10]Does not include far west or Plains areas.
Source: Calculated from Order Buyer Price Information. This table was compiled from Appendix Tables 1-4.

Considering the discount for extra weight and the discount for marketing in the fourth quarter, the estimates suggest that a 400-pound Okie feeder calf in the third quarter, held until the next quarter and weighing 100 pounds more, would have increased in value only about $19 during 1966-68 (Table 1):

$$500\# \times (.2703 - .0158) = 500 \times .2545 = \$127.25$$
$$400 \times .2703 = \$108.12$$
$$\text{Difference} = \$\ 19.13$$

Analysis of prices by areas of Texas resulted in estimates with a range of 45 cents per 100 pounds. The southern area had the highest price and the western and eastern the lowest (Table 1). These differences are small and generally less than transfer cost between markets. It was hypothesized, based on knowledge of movement of feeders, that prices in the northern area would be higher than in the southern area. It is not clear why the southern average price exceeded the northern by 25 cents per 100 pounds. This was not supported by the analysis of feeder steers based on market news data covering a longer time period. However, for the same data source, the average price for feeder heifers at Houston exceeded the Fort Worth price. This finding of conflicting evidence is significant because of the location relative to feeding areas. The Fort Worth and northern Texas markets would normally be expected to be higher than the Houston and southern Texas markets. Errors in classification and measurement could be responsible for this result just as could errors of the marketing system.

Analyses of Market News Data

Recent price differences of feeder cattle sold through major Southwestern markets were estimated. Data were obtained from market locations of Amarillo, Clovis, Fort Worth, Oklahoma City, Phoenix, San Angelo, San Antonio and Houston. The data were monthly averages from market quotations for the 5-year period, 1964-68, issued by the Livestock Division, Agricultural Marketing Service, Department of Agriculture. It was assumed that the grades of cattle are reported uniformly and comparably for all the markets. An important limitation is the possibility of different distributions of cattle for each grade and weight category. This is an unknown in the data that cannot be specified.

Separate analyses were made for steers, for heifers and for all data combined because the price response associated with several characteristics may be different between steers and heifers; however, by combining the data the price difference between steers and heifers could be estimated.

Most of the variability in prices of feeder cattle during the 5-year period 1964-68 was accounted for by

grade, time and sex differences. The time variable accounted for changes in the overall price level due to changes in demand and supply. Prices of feeder cattle were generally increasing from 1964 through 1968 with variability in steer prices being greater than in heifer prices. Variation in price per pound due to weight, market location and season of the year was lower than for the other factors measured (Table 2). The weight effect for heifers, although statistically significant, is not confirmed by other analyses and should be regarded as atypical.

TABLE 2. ESTIMATED DEVIATIONS FROM SPECIFIED FACTORS IN MARKET NEWS PRICES OF FEEDER CATTLE ON MARKETS IN THE SOUTHWEST

Factor	Feeder steers	Feeder heifers	All feeders
	— — — Dollars per cwt. — — —		
Grade			
Prime	3.35	2.90	3.21
Choice	2.15	1.59	1.89
Good	0.00	0.00	0.00
Standard	—2.48	—1.88	—2.20
Utility	—5.37	—4.20	—4.83
Weight[1]			
350 pounds	0.75	—0.66[1]	0.68
400 pounds	0.37	—0.17[1]	0.34
450 pounds	0.00	0.00	0.00
500 pounds	—0.37	—0.15	—0.34
550 pounds	—0.74	—0.61	—0.68
Market location			
Amarillo	0.49	0.06	0.27
Clovis	0.26	0.37	0.30
Fort Worth	0.00	0.00	0.00
Oklahoma City	0.11	—0.40	—0.14
Phoenix	—0.69	—1.18	—0.95
San Angelo	0.30	—0.18	0.04
San Antonio	—0.05	0.28	0.11
Houston	—0.35	0.22	—0.08
Season			
First quarter	0.13	0.29	0.22
Second quarter	0.60	0.72	0.67
Third quarter	0.67	0.83	0.76
Fourth quarter	0.00	0.00	0.00
Sex			
Steers			2.48
Heifers			0.00
Year			
1964	0.00	0.00	0.00
1965	1.71	1.31	1.53
1966	5.58	4.69	5.26
1967	5.60	4.70	5.28
1968	6.39	5.56	6.09

[1]Data on weights were midpoints of quoted weight ranges; as a result the effect of weight on price is less sensitive than other analyses where actual weights of each lot were specified.

Source: Calculated from data obtained from Market News Service, U.S. Department of Agriculture. This table was compiled from Appendix Table 5.

Differences between the grades of Choice, Good and Standard were larger for steers than heifers—the difference of Choice over Good steers was $2.15 and Good over Standard $2.48 per hundredweight. Steers averaged $2.48 above heifers for the same grade and weight (Table 2).

When comparing these estimates with those in Table 1, it should be noted that the estimates in Table 1 are only for Okie cattle not graded by USDA graders. In the previous analysis (Table 1), grades of the order buying firm were used, and the time period differed. Estimates on the effect of weight on price of feeder cattle developed from the market news data (Table 2) would not be expected to be as sensitive as those in Table 1 because the market news quotations referred to weight ranges rather than to average weights per lot. Consequently, estimates of the effect of weight on price are lower than in the previous analysis (Table 1) and are believed to underestimate this factor.

The effect of market location on price was small but statistically significant. Estimates were generally consistent with expectations of higher prices in the cattle feeding areas and lower prices in the surplus cow-calf areas. An exception was the Phoenix market which had the lowest prices for both steers and heifers of all the regional markets considered. Other deviations from the expected occurred in the heifer analysis. The San Antonio and Houston markets were above the Fort Worth, and the opposite was expected.

Despite some unexplained variations, these analyses suggest that the market paid a premium for the higher grades of feeder calves — the improvement of one grade on a 400-pound steer was worth from $6 to $10 per head from 1964 to 1968.

Percentage Differences in Feeder Cattle Prices

With a substantial change in price level, absolute price differences between different factors would be expected to change. To provide a guide that might have more general applications than the absolute differences, percentage price differences associated with grade and weight of feeder cattle were calculated from estimates.

These estimates were expressed in terms of an index based on value per head of a 400-pound Choice steer using data from the order buyer price quotations of Okie steers (Table 3) and data from Market News Service which covered all types of steers generally marketed in the Southwest (Table 4).

The weight indexes were about the same for both sets of data, with value increasing about 10 percent per head for each increase of 50 pounds. The indexes of grade differences were about twice as large for the Market News Service data as for the order buyer data.

TABLE 3. VALUE INDEX OF "OKIE" FEEDER STEERS RELATIVE TO CHOICE 400-POUND STEER[1]

Grade[2]	350 lb	400 lb	450 lb	500 lb
	— — — Percent of total value per head — — —			
Okie #1	89.4	100.0[3]	110.0	119.5
Okie #2	85.8	95.8	105.3	114.3
Okie #3	81.7	91.2	100.1	108.5

[1]Subtract about 12% for Okie heifers of the same weight and grade. Also subtract about 3% for animals marketed in the fourth quarter.
[2]Order buyer grades are not official USDA grades.
[3]Estimated average price of Okie #1 feeder steer weighing 400 pounds was $27.96/cwt during 1966-68.
Source: Calculated from Order Buyer Quotations.

The value index based on Market News Service data suggests a grade difference of almost 10 percent between adjacent grades of steers (Table 4), whereas, that for an Okie steer was almost 5 percent. This suggests that the order buyer grades are more narrowly defined than the USDA grades.

Given a price that can be used as a base, these indexes may be used to estimate the value of a different grade and weight category by multiplying the price of a certain category by the ratio of the indexes of the base and the other category. For example, if the value of a 450-pound USDA Good steer was $135, the value of a 500-pound USDA Choice steer would be estimated by $135 × 122.0/102.2 = $161.

Estimates in Table 3 would be more appropriate for Okie feeders and in Table 4 for English beef breeds.

Price Differences of Slaughter Cattle

The influence of selected factors on the price per hundredweight of slaughter cattle sold through major livestock markets in the Southwest was examined. Market price quotations issued by the Livestock Division, Agricultural Marketing Service, U.S. Department of Agriculture furnished data for the analyses. Usable data were obtained from the regional market locations of Clovis, Fort Worth, Oklahoma City, San Antonio and Houston.

TABLE 4. VALUE INDEX OF FEEDER STEERS RELATIVE TO USDA CHOICE 400-POUND STEER[1]

Grade	400 lb	450 lb	500 lb
	— — Percent of total value per head — —		
USDA Choice	100.0[2]	111.3	122.0
USDA Good	91.9	102.2	111.8
USDA Standard	82.5	91.6	100.1

[1]All types of feeder steers reported by Market News Service, USDA. Subtract about 10% for heifers of the same weight and grade. Also subtract about 2% for calves marketed in the fourth quarter.
[2]Estimated average price of 400-pound USDA Choice feeder steer was $26.44/cwt during 1964-68.
Source: Calculated from Market News Quotations.

The performance of the assembly function for slaughter cattle has undergone rapid change. To a large degree, the processor is bypassing established marketing facilities and assembling slaughter cattle by purchasing directly from feedlot operators. By 1967, almost all of the fed cattle produced in Texas and Oklahoma were sold on a direct-to-packer basis. Feedlot operators reported practically no shipments to public markets in a study made by Dietrich (2). However, 82 percent of the feedlots in Texas and 67 percent of the feedlots in Oklahoma used federal-state live cattle quotations as their primary sources of price information.

San Angelo, Phoenix and Amarillo reported no, or very few, quotations for slaughter steers and heifers for 1964 through 1968. Consequently, these markets were not included in the analyses. Oklahoma City reported quotations only for the years 1964, 1965 and part of one quarter for 1966. No price quotations for 1967 and only two quarters in each of the years 1966 and 1968 were reported at Houston. Other regional markets reported data for only one or a few grade-weight classifications over the 1964-68 period. Consequently, only data for the period 1964-66 were subjected to analysis. Further, only price quotations for the grades of Good and Choice were used. Because of these limitations the results must be interpreted with caution.

Although data were less complete than for feeder cattle, estimates were generally in line with expectations. Choice over Good grade was $1.49 per hundredweight for steers and $1.30 for heifers. The price of steers averaged $0.62 above that of heifers for the same grade and weight range (Table 5 and Appendix Table 6).

For steers, weights of 950 to 1,050 were estimated to bring the highest prices; however, there was little difference paid per pound for steers weighing between 850 and 1,150 of the same grade. The difference in prices of different weights of heifers of the same grade was not statistically significant (Table 5).

Estimates of influence of market location are subject to question. Those for slaughter steers were not statistically significant and those for heifers difficult to explain because prices at Clovis, a surplus feeding area, averaged higher than at other markets except Houston. The analyses of both steers and heifers were expected to yield a lower price at Clovis than at the other markets. Since they did not, this should be considered a tentative finding.

TABLE 5. ESTIMATED DEVIATIONS FROM SPECIFIED FACTORS IN MARKET NEWS PRICES OF SLAUGHTER CATTLE ON MARKETS IN THE SOUTHWEST (1964-1966)

Variable	Slaughter steers	Slaughter heifers	Combined
	— — — — Dollars per cwt — — — —		
Grade			
Choice	1.49	1.30	1.43
Good	0.00	0.00	0.00
Weight			
650 pounds	—0.59	NS	NS
750 pounds	—0.27		
850 pounds	—0.06		
950 pounds	—0.03		
1,050 pounds	0.0		
1,150 pounds	—0.14		
1,250 pounds	—0.41		
1,350 pounds	—0.78		
Market location			
Clovis	0.32 N.S.	0.54	0.41
Fort Worth	0.00 N.S.	0.00	0.00
Oklahoma City	0.11 N.S.	0.45	0.24
San Antonio	0.19 N.S.	0.34	0.29
Houston	0.41 N.S.	0.83	0.45
Season			
First quarter	—1.04	—0.67	—0.87
Second quarter	—0.30	—0.01	—0.16
Third quarter	0.59	0.58	0.59
Fourth quarter	0.00	0.00	0.00
Sex			
Steers			0.62
Heifers			0.00
Year			
1964	0.00	0.00	0.00
1965	2.44	1.86	2.18
1966	3.83	3.60	3.72

NS indicates the estimates were not significantly different from the group mean at a probability level of at least 90%.

Source: Calculated from data obtained from Market News Service U.S. Department of Agriculture. More detail in Appendix Table 6.

The estimates from these analyses suggest that the value of a 1,000-pound Choice steer over a Good steer of the same weight was about $15 per head. The market transferred about two-thirds of this premium back to the feeder calf (comparison of estimates from Tables 4 and 5). The difference per head for steers and heifers appeared to be higher for the feeder ($10) than for the 1,000-pound slaughter animal ($6). That seasonal price differences were lowest in the first quarter reflected lower costs for feeder cattle purchased in the fourth quarter.

Estimates of individual factors that affect prices of feeder and slaughter cattle documented the generally accepted hypothesis that the live cattle markets of the Southwest operate competitively and pricing is relatively efficient. Deviations from expectations based on economic theory were small and could be due either to errors in measurement or errors by participants in the market.

Trends in Price Differences of Feeder and Slaughter Cattle

Trends in feeder and slaughter cattle annual average price differences associated with selected factors were analyzed. Specifically, the following hypothesis was examined: Developments in the last two decades have resulted in a narrowing of price differences among market classes, grades and weights of slaughter cattle. This hypothesis was based, in part, on the occurrence of a decrease in the value of edible tallow and on the consumer's changing preferences toward less fat and waste on retail cuts of beef; therefore, higher quality or heavier slaughter animals should be decreasing in price relative to lower quality or lighter animals. Within a given weight and grade, it was believed that the price difference of a slaughter steer over a slaughter heifer had decreased because of improved feeding and management of heifers on feed. Feedlots are now able to produce slaughter heifers to a given weight with less risk to the packer and retailer of excess waste as compared with those marketed in the past.

The hypothesis that price differences among market classes, grades and weights of feeder cattle have increased was also considered. This hypothesis was based on changes provided by the development and growth of the large feedlots and the increased efficiency of realizing gains. In addition, it was believed that the more specialized feeding industry is more accurately reflecting the value of individual feeder animals than it was formerly. The increased efficiency in feeding would be expected to place a relatively higher price on lighter animals and on lower quality animals. The efficiency of feeding heifer cattle has increased, but the increase in the efficiency of feeding steer cattle may have been greater; therefore, a widening of the price difference of a feeder steer of a given weight and grade over a comparable feeder heifer might be expected. Linear regression and correlation analysis was the statistical method used to test the hypotheses.

The general model is represented by the equation

$$P_d = B_0 + B_1T + E$$

Where

P_d = annual average price difference per hundredweight of animals differing by a selected factor,

T = time in years,

E = error term.

Data used in the analyses were obtained from annual average market quotations issued by the Livestock

Division, Agricultural Marketing Service, U.S. Department of Agriculture. Omaha market quotations were used in the analyses of price differences of slaughtered cattle and Kansas City quotations in the analyses of price differences of feeder cattle. These two markets were selected as the most representative of the national market for the type of cattle considered.

Trends in Price Differences of Slaughter Cattle

The results of statistical analyses and graphs of the trend line and observations were examined for abrupt changes in trend due to grade changes. Although no abrupt changes were noted, there was evidence of some modifications due to fundamental shifts in buyer demand.

Price Trends Associated with Grade Differences

Annual average price differentials per hundredweight associated with grade differences for both slaughter heifers and steers trended downward over the 14-year period 1955-68 (Table 6 and Figures 1 and 2). The 14-year average price difference per 100 pounds for Prime slaughter steers over Choice slaughter steers was about $1.50 for all three weight classifications examined — 900 to 1,100 pounds, 1,100 to 1,300 pounds and 1,300 to 1,500 pounds. In each case, the price difference of Prime grade steers over Choice grade steers has trended downward at about 14 cents per year over the period. Based on the regression equations, 1968 price differences of Prime slaughter steers over Choice slaughter steers were estimated to be 52 cents for 900- to 1,100-pound animals, 62 cents for 1,100- to 1,300-pound animals and 54 cents for 1,300- to 1,500-pound animals.

The 14-year average price difference of Choice grade slaughter steers over Good grade slaughter steers of the two weight classifications, 900 to 1,100 pounds and 1,100 to 1,300 pounds, was $2.32 per hundredweight. For both weight classifications, this price difference has trended downward at about 10 cents per year over the period. Estimates of the 1968 price differences of Choice steers over Good steers were $1.64 for the 900- to 1,100-pound animals and $1.62 for the 1,300- to 1,500-pound animals.

The price differences per 100 pounds for Prime slaughter heifers over Choice slaughter heifers weigh-

TABLE 6. TRENDS IN PRICE DIFFERENCES DUE TO GRADE DIFFERENCES IN SLAUGHTER CATTLE AT OMAHA (1955-1968)

Equation no.	Explanation	Price difference (PD) Estimated 1972	Estimated 1968	1955-68 Average	Regression in estimates: Intercept value (b_0)	Trend in PD 1955-68 (b_1)	R^2	S
		— — — — — — — Dollars per cwt — — — — — — —						
Steers, 900 to 1,100 lb								
4-1	Prime minus Good	1.19	2.17	3.76	5.5880	—.2443**	.7545	.6068
4-2	Choice minus Good	1.23	1.64	2.32	3.0918	—.1035**	.5989	.3687
4-3	Prime minus Choice	— .05	.52	1.44	2.5048	—.1417**	.8249	.2843
Steers, 1,100 to 1,300 lb								
4-4	Prime minus Good	1.21	2.24	3.91	5.8309	—.2566**	.7509	.6435
4-5	Choice minus Good	1.19	1.62	2.32	3.1263	—.1074**	.5763	.4010
4-6	Prime minus Choice	.02	.62	1.59	2.7046	—.1492**	.8241	.3001
Steers, 1,300 to 1,500 lb								
4-7	Prime minus Choice	.03	.54	1.45	2.5113	—.1410**	.8037	.3034
Heifers[a]								
4-8	Prime minus Good	2.07	2.58	3.39	4.3353	—.1256**	.5235	.5216
4-9	Choice minus Good	1.69	1.89	2.21	2.5830	—.0495*	.3082	.3232
4-10	Prime minus Choice	.39	.69	1.18	1.7466	—.0755**	.6718	.2296
Heifers, Light Weight[b]								
4-11	Choice minus Good	1.87	2.02	2.27	2.5603	—.0383†	.2249	.3098

**Refers to a probability level of 99%.

*Refers to a probability level of 95%.

†Refers to a probability level of 90%.

[a]It was not possible to hold weight groups completely constant over time due to changes in price reporting. Weight classifications for Prime and Choice heifers were 800 to 1,000 pounds during 1955-59, 900 to 1,100 pounds during 1960-68; Good heifers were 700 to 900 pounds during 1955-59 and 800 to 1,000 pounds during 1960-68.

[b]Weight classifications for Choice heifers were 600 to 800 pounds during 1955-59, 700-900 pounds during 1960-68; Good heifers were 500 to 700 pounds during 1955-59 and 600 to 800 pounds during 1960-68.

Source: Calculated from data obtained from Market News Service, USDA.

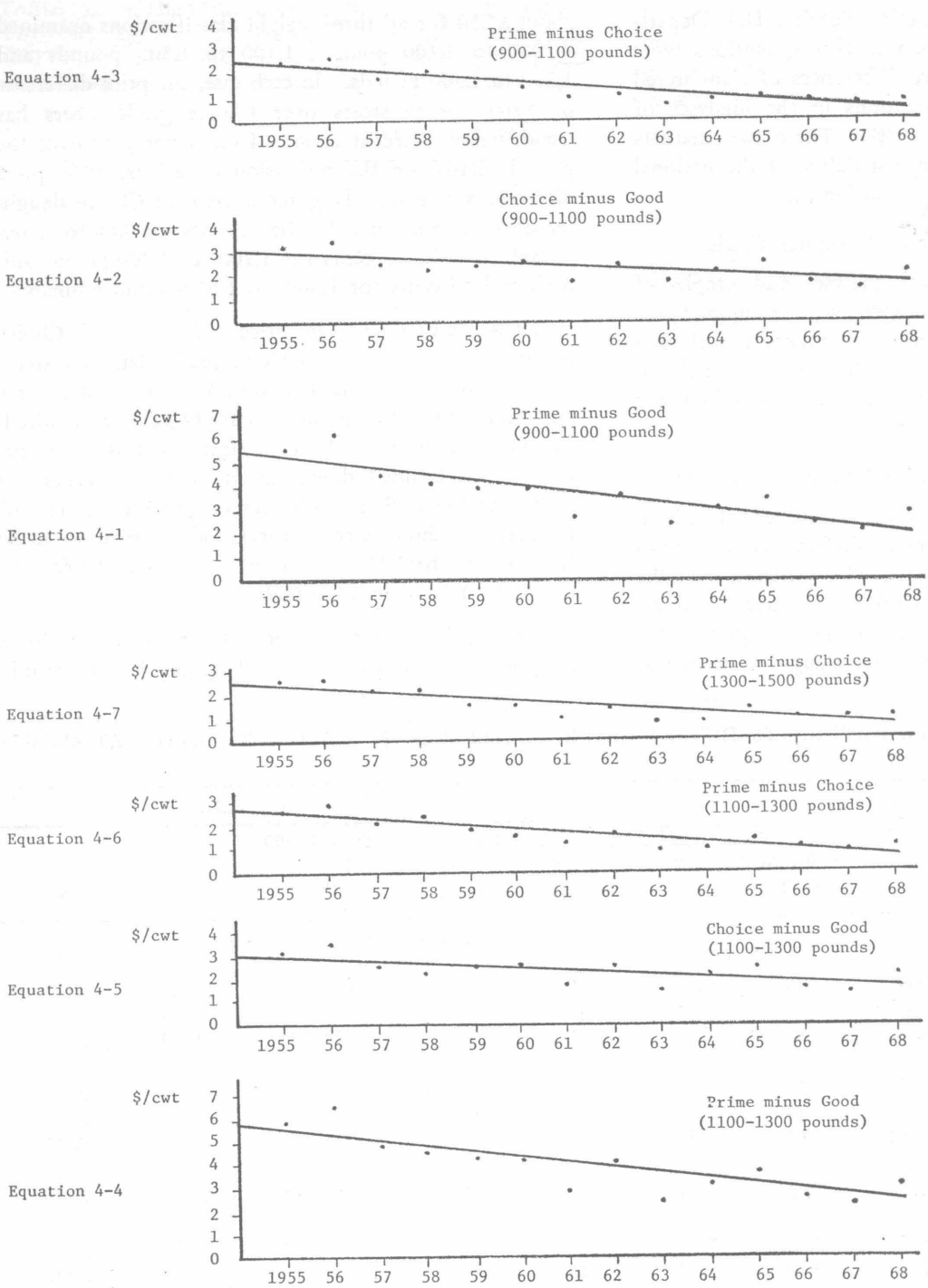

Figure 1. Trends in price differences between grades of slaughter steers at Omaha.

ing approximately 800 to 1,100 pounds averaged $1.18 during the 14-year period. This price difference trended downward at the rate of 8 cents per year, and for 1968 the equation estimated a price difference of Prime slaughter heifers over Choice slaughter heifers of 69 cents. The average price difference per hundredweight for Choice slaughter heifers weighing about 500 to 800 pounds over Good slaughter heifers of the same weight was $2.27 and decreased at an average rate of 4 cents per year. The 1968 price difference of Choice slaughter heifers over Good slaughter heifers was estimated to be $2.02. The average price difference of Choice slaughter heifers over Good slaughter heifers weighing approximately 700 to 1,100 pounds was $2.21. This price difference trended downward at the rate of 3 cents per year and was estimated to be $1.98 in 1968.

All of the equations which examined trends in price differences associated with grade differences in slaughter cattle reflected a downward trend. Except for two equations, the regression coefficients were signifi-

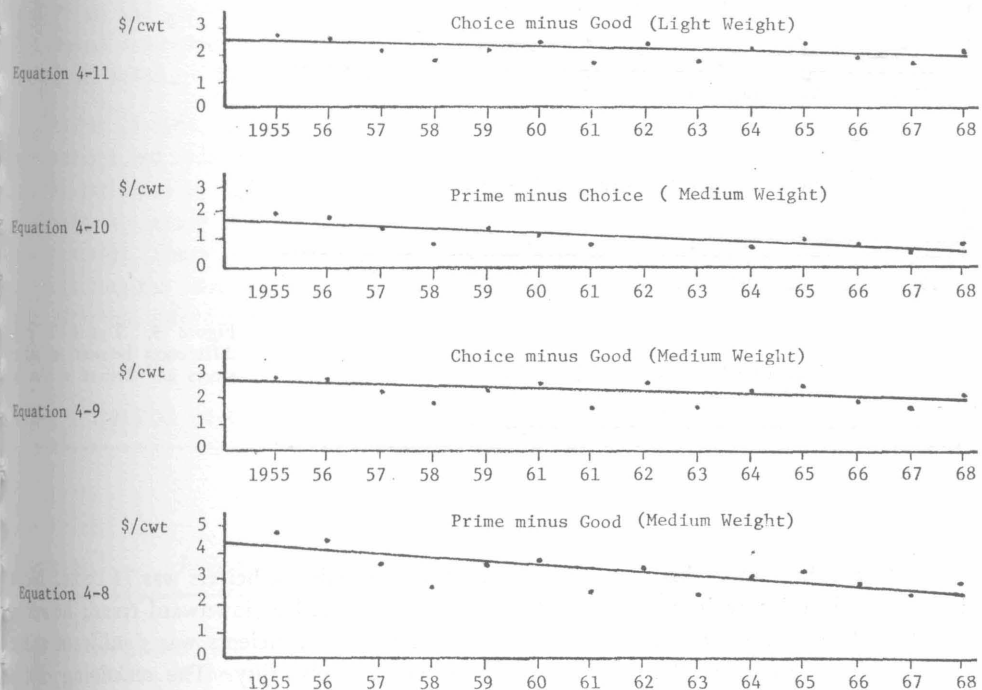

Figure 2. Trends in price differences between grades of slaughter heifers at Omaha.

cant at the 99-percent level of probability. One of the two remaining trend coefficients was significant at the 95- percent level, and the second coefficient was significant at the 90-percent level of probability. On the basis of these results, the hypothesis that price differences associated with grades of slaughter cattle have decreased cannot be rejected.

Price Trends Associated with Weight Differences

Because of a lack of data for slaughter heifers, equations were calculated only for the price differences associated with weight differences for slaughter steers. All of the equations reflected very little rise or fall over the period under study (Table 7 and Figure 3). Only one of the seven trend coefficients calculated was significant at a probability level of at least 90 percent. Based on these results, the hypothesis that price differences associated with weight differences in slaughter cattle have decreased cannot be accepted.

The 14-year average price difference per hundredweight associated with weight differences varied from 48 to −12 cents per hundredweight. For the prime

TABLE 7. TRENDS IN PRICE DIFFERENCES DUE TO WEIGHT DIFFERENCES OF SLAUGHTER STEERS AT OMAHA (1955-1968)

			Regression estimates			
Equation no.	Explanation	Average price difference (PD)	Intercept value (b_0)	Trend in PD 1955-68 (b_1)	R^2	S
		— — — — — — — — Dollars per cwt — — — — — — — —				
U.S. Prime steers						
4-12	(900 to 1,100) minus (1,300 to 1,500)	.36	.3529	.0009 NS	.0001	.3715
4-13	(1,100 to 1,300) minus (1,300 to 1,500)	.48	.4456	.0044 NS	.0084	.2078
4-14	(900 to 1,100) minus (1,100 to 1,300)	—.12	—.0927	—.0035 NS	.0061	.1973
U.S. Choice steers						
4-15	(900 to 1,100) minus (1,300 to 1,500)	.37	.3679	.0007 NS	.0001	.2961
4-16	(1,100 to 1,300) minus (1,300 to 1,500)	.35	.2523	.0125 NS	.0935	.1702
4-17	(900 to 1,000) minus (1,100 to 1,300)	.03	.1156	—.0119 NS	.0965	.1584
U.S. Good steers						
4-18	(900 to 1,100) minus (1,100 to 1,300)	.03	.1501	—.0158†	.2458	.1207

NS indicates the trend coefficient does not differ from zero at a probability level of at least 90%.
†Refers to a probability level of 90%.
Source: Calculated from data obtained from the Market News Service, USDA.

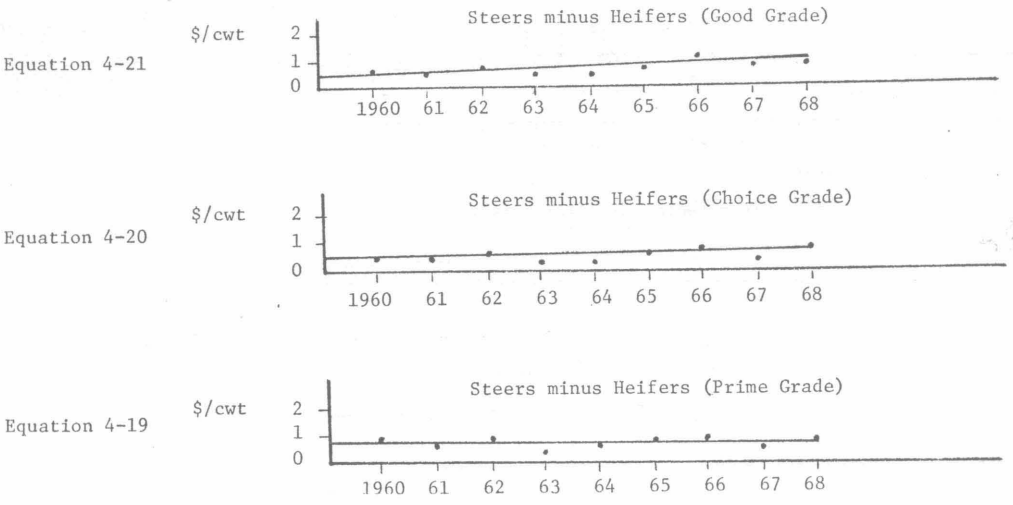

Figure 3. Trends in price differences between slaughter steers and heifers at Omaha

grade, the 1,100- to 1,300-pound weight range had slightly higher prices than lighter or heavier weights. For the Choice grade the 900- to 1,100-pound weight range had the highest prices. Within a grade of the three top USDA grades, there was practically no difference in price paid for steers weighing between 900 and 1,300 pounds; however, weights beyond 1,300 pounds were discounted up to $0.50. The small differences in price due to heavier weights showed no significant trend over the 14-year period.

Trends in Price Differences Between Steers and Heifers

Data for the period 1960 through 1968 were used for analysis of price differences between steers and heifers weighing approximately 900 to 1,100 pounds in each of the three grade categories — Prime, Choice and Good (Table 8 and Figure 3). The average price difference of steers over heifers was 76 cents for both Prime and Good grades. The average price difference of Choice steers over Choice heifers was 71 cents. None of the equations reflected a downward trend; however, only one of the trend coefficients was significant at the 95-percent level of probability. The remaining coefficients were not significantly different from zero at a probability level of at least 90 percent. On the basis of these results, the hypothesis that price differences between slaughter steers and slaughter heifers have decreased cannot be accepted.

Trends in Price Differences of Feeder Cattle

Because of weight classification changes by market news reporters, it was not possible to hold weight constant in the analyses. Changes also occurred in the methods of reporting grade classifications; for example, the classification 300- to 500-pound Good and Choice heifers was used from 1955 through 1961. In 1962 this classification was separated into the two classifications of 300- to 500-pound Choice heifers and 300- to 500-pound Good heifers. At times a combination

TABLE 8. TRENDS IN PRICE DIFFERENCES BETWEEN SLAUGHTER STEERS AND HEIFERS AT OMAHA (1960-1968)

Equation no.	Explanation	Price difference (PD)		Regression estimates			
		Estimated 1968	1960-68 average	Intercept value (b_0)	Trend in PD 1959-68 (b_1)	R^2	S
		— — — — — — — — Dollars per cwt — — — — — — — —					
Steers minus heifers							
4-19	Prime, 900 to 1,100	.77	.76	.7581	.0008 NS	.0002	.179
4-20	Choice, 900 to 1,100	.83	.71	.5578	.0300 NS	.3048	.132
4-21	Good, steers 900 to 1,100 heifers 800 to 1,000	.98	.76	.4883	.0550*	.4869	.165

*Refers to a probability level of 95%.

NS indicates the coefficient was not different from zero at a probability level of at least 90%.

Source: Calculated from data obtained from the Market News Service, USDA.

both weight and grade classification changes occurred. The changes associated with data used in a particular analysis are noted in Table 9.

Further, in 1964, the U.S. Department of Agriculture renamed and redefined feeder cattle grades. Prior to 1964, there was an "easing up" in the interpretation of the existing grade standards in anticipation of the new standards. There is little published material available regarding the translation of the two sets of standards. However, information obtained from a representative of the USDA Market News Service indicated that the standards are roughly comparable grade by grade. In view of the preceding, this study assumed the two sets of grade standards to be directly translatable.

Price Trends Associated with Grade Differences

Due to a lack of data, only two equations were calculated: Choice grade compared with Good grade for medium weight steers and Choice grade compared with Good grade for heavier weight steers (Table 9

TABLE 9. TRENDS IN PRICE DIFFERENCES FOR FEEDER CATTLE AT KANSAS CITY (1955-1968)

Equation no.	Explanation	Price difference (PD) Estimated 1972	Price difference (PD) Estimated 1968	Price difference (PD) 1955-68 Average	Regression estimates Intercept value (b_0)	Regression estimates Trend in PD 1955-68 (b_1)	R^2	S
		— — — — — — — Dollars per cwt — — — — — — —						
Effect of grade[a] (steers)								
	Medium weights							
4-22	Choice minus Good	2.77	2.63	2.40	2.1415	.0347†	.2181	.2865
	Heavy weights							
4-23	Choice minus Good	1.99	1.85	1.61	1.3430	.0362†	.2201	.2965
Effect of weight[b] (Good & Choice steers)								
4-24	Light minus Heavy	4.21	3.99	3.64	3.2313	.0541 NS	.0187	1.7085
4-25	Medium minus heavy	1.63	1.54	1.40	1.2418	.0214 NS	.0200	.6513
4-26	Light minus medium	2.58	2.45	2.23	1.9896	.0327 NS	.0164	1.1047
Effect of sex[c]								
	Light weights							
4-27	Steers minus Heifers	4.09	3.80	3.34	2.8135	.0708**	.4161	.3650
	Medium weights							
4-28	Steers minus heifers	3.03	2.94	2.81	2.6504	.0210 NS	.0545	.3805

†Refers to a probability level of 90%.

**Refers to a probability level of 99%.

NS indicates that the coefficient is not significant at a probability level of at least 90%.

[a]It was not possible to hold weights completely constant over the 14-year period. The classifications were changed slightly during the period. In Equation 4-22, weights for both grades were 500 to 800 pounds for the years 1955-65 and 550 to 750 pounds and 750 to 1,000 pounds for the years 1966-68. In Equation 4-23, weights for both grades were 800 to 1,050 pounds for the years 1955-61, 800 to 1,000 pounds for the years 1962-65 and 750 to 1,000 pounds for the years 1966-68.

[b]Prices used in the analyses were: For lighter weight animals, the price of the *one* grade classification, Good and Choice, for the years 1955-61; and the average price of the *two* classifications of Good and Choice for the years 1962-68. For the classification of medium and heavier weight animals, the average price of the two grades of Good and Choice was used for the entire 14-year period. Weight classifications used in the analyses were: For the lighter weight animals, 300 to 500 pounds for the years 1955-61, 300 to 550 pounds for the Choice grade for the years 1962 through 1968, 300 to 500 pounds for the Good grade for the years 1962 through 1965 and 300 to 550 pounds for the years 1966 through 1968; for the medium weight animals, 500 to 800 pounds for both Choice and Good grades for the years 1955 through 1966 and 550 to 750 pounds for both grades for the years 1966 through 1968; for the heavier animals, 800 to 1,050 pounds for the two grades of Good and Choice for the years 1955 through 1961, 800 to 1,000 pounds for both grades for the years 1962 through 1965 and 750 to 1,000 pounds for the two grades for the years 1966 through 1968.

[c]Prices used in this analysis of lighter weight animals were: For both steers and heifers, prices for the *one* grade classification of Good and Choice for the years 1955 through 1961 and the average of the prices of the *two* grades of Choice and Good for the years 1962 through 1968. Weight classifications were: 300 to 500 pounds for both steers and heifers for the years 1955 through 1961; for Choice grade steers, 300 to 550 pounds for the years 1962 through 1968; for Good grade steers, 300 to 500 pounds for the years 1962 through 1965 and 300 to 550 pounds for the years 1966 through 1968; for both Good and Choice grades of heifers, 300 to 500 pounds for the years 1962 through 1968.

For medium weight steers and heifers, prices for the grade classification of Choice were used. The weight classifications were: For steers, 500 to 800 pounds for the years 1955 through 1965, and 550 to 750 pounds for the years 1966 through 1968; for heifers, 500 to 750 pounds for the years 1955 through 1965, and 500 to 700 pounds for the years 1966 through 1968.

Source: Calculated from data obtained from the Market News Service, USDA.

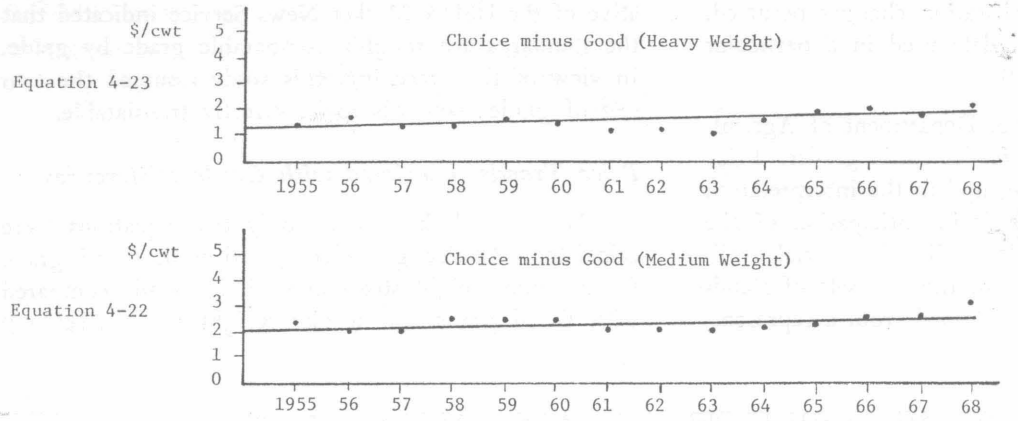

Figure 4. Trends in price differences between grades of feeder steers at Kansas City.

and Figure 4). The average price difference between Choice and Good feeder steers of the medium weight category was $2.40 per 100 pounds. For the heavier weight category, Choice feeder steers were found to have an average price difference of $1.61 per hundredweight over Good steers. The 1968 price differences were estimated to be $2.63 and $1.85, respectively. Both of the equations exhibited an upward trend of 3.5 cents per year, and the trend coefficients were significantly different from zero at a probability level of 90 percent. On the basis of these results, the hypothesis that price differences associated with grades of feeder cattle have increased cannot be rejected.

Price Trends Associated with Weight Differences

Price differences associated with weight differences of feeder steers exhibited slight upward trends for the 14-year period 1955 through 1968 (Table 9 and Figure 5). However, none of the regression coefficients were significantly different from zero at a probability level of at least 90 percent. On the basis of these results, the hypothesis that price differences associated with weights in feeder cattle have increased cannot be accepted.

The average price difference of lighter animals (approximately 300 to 500 pounds) over heavier animals (approximately 800 to 1,000 pounds) was $3.64. Medium weight animals (approximately 500 to 800 pounds) had an average price difference of $1.40 per hundredweight over heavier feeder steers. During the 14-year period, the average price difference of lighter weight steers over medium weight steers was $2.23.

Trends in Price Differences Between Steers and Heifers

Two equations were calculated to determine the trend in price differences associated with market class — steer prices minus heifer prices for lighter weight

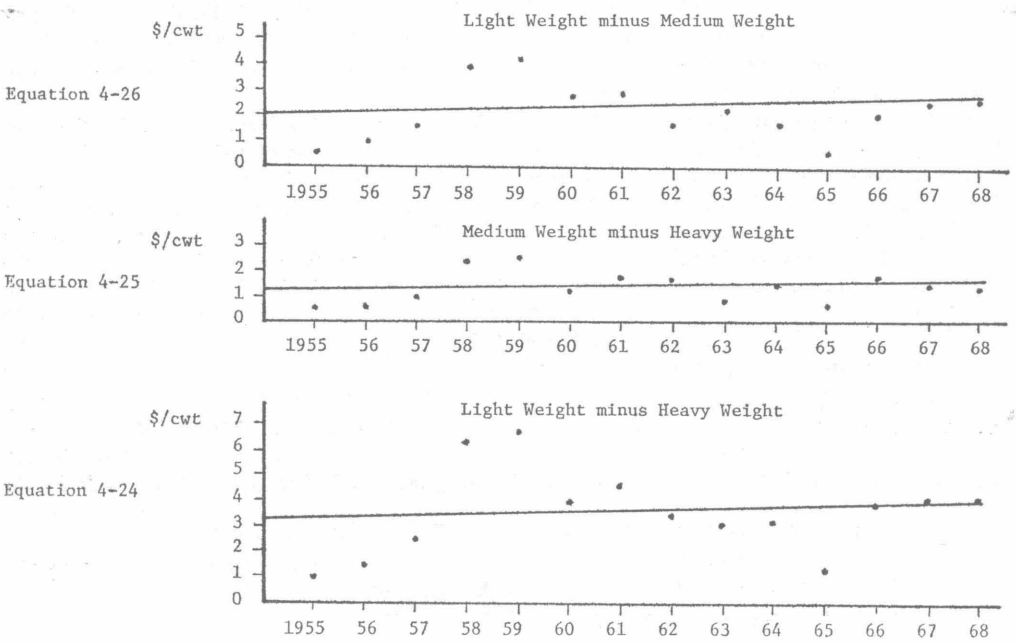

Figure 5. Trends in price differences between differing weights of feeder steers at Kansas City.

animals and steer prices minus heifer prices for medium weight animals (Table 9 and Figure 6). Both equations exhibited an upward trend. However, the trend coefficient calculated for the medium weight animals (approximately 500 to 800 pounds) was not significant at a probability level of at least 90 percent. The trend coefficient calculated for the lighter weight animals (approximately 300 to 500 pounds) was significant at a probability level of 99 percent. Considering the results, the hypothesis that price differences associated with market class in feeder cattle have increased cannot be rejected for the lighter weight animals and cannot be accepted for the heavier weight animals. The average price differential of steers over heifers was $2.81 for the heavier animals and $3.34 for the lighter animals. The price difference of lighter weight steers over lighter weight heifers was estimated to be $3.80 in 1968. The trend coefficient for the lighter weight animals indicated an average increase in the price difference of 7 cents per year.

Summary of Trends in Price Differences of Feeder and Slaughter Cattle

Trends in feeder cattle and slaughter cattle price differences associated with the selected animal characteristics of grade, weight and market class are summarized.

The specific hypotheses tested were (1) Developments in the last two decades have resulted in a narrowing of price differences among grades, weights and market class of slaughter cattle and (2) Developments in the last two decades have resulted in a widening of price differences among grades, weights and the market class of feeder cattle.

On the basis of statistical tests of the trend coefficients, it was found that price differences among grades of slaughter cattle have decreased and price differences among grades of feeder cattle have increased. Both trends were consistent with the hypotheses, but slight changes which have occurred in USDA grade specifications may account for some of the trend in both cases. If the trend of price differences between Prime and Choice grades of slaughter cattle continues, by 1972 there will be no difference in price between the two grades. This implies that there will be no price incentive for producing feeder cattle that will grade prime at slaughter weights. On the other hand, the price difference of Choice feeders over Good feeders is widening and is projected to be 14 cents greater in 1972 than the estimated 1968 price difference. This implies an increasing incentive to produce feeder calves which grade Choice as opposed to feeder calves which grade Good.

For the lighter weight feeder cattle, the value of a steer relative to that of a heifer has increased as hypothesized; however, the trend in the price difference between feeder steers and heifers of heavier weights was nonsignificant, possibly because the increase in the feeding efficiency of heavier steers and heifers has increased about equally. The price differences between slaughter steers and heifers exhibited no trend possibly because of the use of terminal market price data in the analysis. The slaughter animals passing through the terminal markets are, for the most part, small lots of farmer-produced animals, and, consequently, the risk to the packer of excess waste associated with heifers is unchanged over the period covered by the analysis. Price differences associated with weight for both feeder and slaughter animals exhibited no trend.

Acknowledgments

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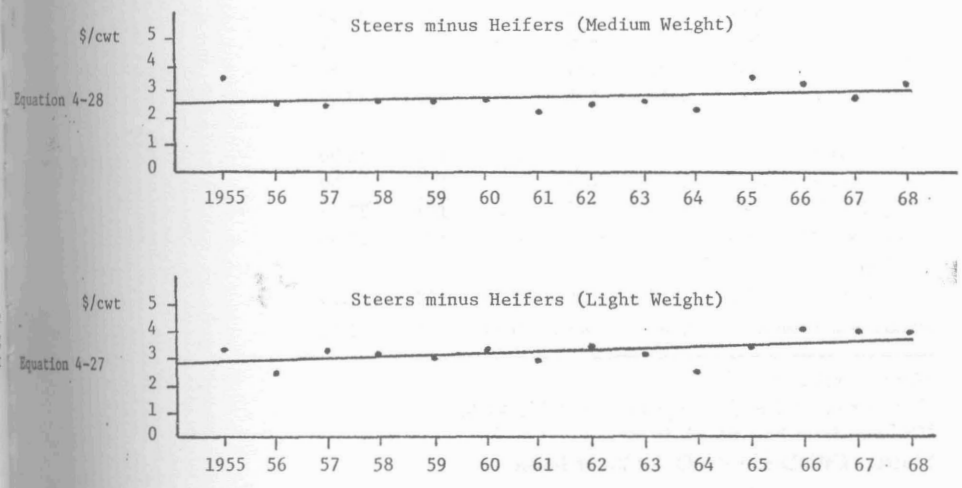

Figure 6. Trends in price differences between feeder steers and heifers at Kansas City.

to R. A. Dietrich, R. J. Freund, C. F. Lard and C. E. Shafer for reviewing the manuscript.

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Appendix

APPENDIX TABLE 1. UNADJUSTED MEANS OF VARIABLES CLASSIFIED BY MONTHS AND AREAS — LIVESTOCK AUCTION DATA (1968)[1]

Independent variable	Number of lots	Mean of specified variables: (X_1) Grade[2]	(X_2) Weight (lbs)	(X_3) Lot size	(X_4) Distance[3] (miles)	(Y) Price ($/cwt)
Month						
M_1, January	290	.417	399	4.9	157	25.82
M_3, March	543	.538	408	4.5	156	27.82
M_5, May	469	.727	401	5.2	160	28.27
M_7, July	505	.541	395	6.3	167	27.94
M_9, Sept.	569	.460	396	9.8	171	26.07
M_{10}, Oct.	688	.445	400	10.4	163	26.20
M_{11}, Nov.	592	.480	405	7.6	162	27.04
Area						
A_1, Eastern	1756	.509	400	8.4	181	26.90
A_2, Northern	674	.518	400	7.7	153	27.09
A_4, Southern	541	.556	406	4.8	101	27.04
A_5, Western	685	.491	400	6.3	173	27.30
Total or average	3,656	.514	401	7.3	162	27.03
Standard deviation		.50	42.3	6.89	45.1	1.52

[1]Area 3 excluded.
[2]Number one Okie = 1; number two Okie = 0.
[3]Distance from Fort Worth in miles.
Source: Calculated from Order Buyer Invoices.

APPENDIX TABLE 2. ESTIMATES OF DIFFERENCES IN PRICES OF OKIE #1 AND OKIE #2 FEEDER STEERS AND BULLS DUE TO SPECIFIED FACTORS (SELECTED MONTHS — 1968)[1]

Independent variable	Equation 2-1 Complete model	Equation 2-2 Areas eliminated	Equation 2-3 Months eliminated
	— — — — — Dollars per cwt — — — — —		
Constant	32.6643	32.6214	32.7265
X_1, Grade	1.3535	1.3516	1.6262
	(51.02)	(49.81)	(44.60)
X_3, Weight	— .0158	— .0158	— .0156
	(51.21)	(50.13)	(36.10)
X_5, Lot size	—.01158	— .0135	— .0408
	(5.61)	(6.56)	(15.01)
X_4 Distance	.0006	.0008	.0003
	(1.79)	(2.85)	(.54)
A_1, Eastern	— .1658		— .1324
A_2, Northern	.0324 NS		.0141 NS
A_4, Southern	.2837		.2299
A_5, Western	— .1521		— .1116
M_1, January	— 1.1155	— 1.1143	
M_3, March	.8709	.8613	
M_5, May	.9560	.9501	
M_7, July	.7703	.7720	
M_9, September	— .9459	— .9207	
M_{10}, October	— .6958	— .6903	
M_{11}, November	.1600	.1419	
S	.776	.795	1.092
R^2	.739	.726	.484
n	3656	3656	3656

[1]Data from southeastern area (A_3) excluded.

The numbers in parentheses are t values associated with the estimate above each.

NS indicates the b value for discrete variables not statistically significant from zero at a probability level of at least 90 percent. However, the deleted variable's coefficient was not tested as its standard deviation was not part of the computer output. Within a group of discrete variables, the deleted variable is the last one of the group.

Source: Calculated from Order Buyer Invoices.

APPENDIX TABLE 3. ESTIMATES OF DIFFERENCES IN PRICE QUOTATIONS OF FEEDER STEERS AND BULLS DUE TO SPECIFIED FACTORS (1966-1968)

Independent variable	Equation 2-4 Complete model	Equation 2-5 Grades eliminated	Equation 2-6 Quarters eliminated
	— — — — Dollars per cwt — — — —		
Constant	31.6651	32.3260	31.6807
G_1, Okie #1	1.2119		1.2115
G_2, Okie #2	.0420 NS		.0416 NS
G_3, Okie #3	— 1.2539		— 1.2531
X_1, Weight	— .0123	— .0137	— .0123
	(36.88)	(31.82)	(34.62)
Q_1, Jan., Feb., Mar.	.0546 NS	.0473	
Q_2, April, May, June	.3414	.3448	
Q_3, July, Aug., Sept.	.3456	.3463	
Q_4, Oct., Nov., Dec.	— .7416	— .7348	
S	1.209	1.507	1.289
R^2	.636	.434	.586
n	1497	1497	1497

The numbers in parentheses are t values associated with the estimate above each.

NS indicates the b value for discrete variables not statistically significant from zero at a probability level of at least 90 percent. However, the deleted variable's coefficient was not tested as its standard deviation was not part of the computer output. Within a group of discrete variables, the deleted variable is the last one of the group.

Source: Calculated from Order Buyer Price Quotations.

APPENDIX TABLE 4. ESTIMATES OF DIFFERENCES IN PRICES OF OKIE #1 FEEDER HEIFERS AND STEERS AND BULLS DUE TO SPECIFIED FACTORS (1966-1968)

Independent variable	Equation 2-7 Complete model	Equation 2-8 Quarters eliminated
	— — — Dollars per cwt — — —	
Constant	29.4805	29.5142
X_1, Weight	— .0129	— .0129
	(21.49)	(19.53)
X_2, Sex	3.6557	3.6558
	(36.44)	(33.06)
Q_1, Jan., Feb., Mar.	— .1060 NS	
Q_2, April, May, June	.4540	
Q_3, July, Aug., Sept.	.5071	
Q_4, Oct., Nov., Dec.	— .8551	
S	1.184	1.306
R^2	.773	.723
n	558	558

The numbers in parentheses are t values associated with the estimate above each.

NS indicates the b value for discrete variables not statistically significant from zero at a probability level of at least 90 percent. However, the deleted variable's coefficient was not tested as its standard deviation was not part of the computer output. Within a group of discrete variables, the deleted variable is the last one of the group.

Source: Calculated from Order Buyer Price Quotations.

APPENDIX TABLE 5. SUMMARY OF ESTIMATES OF DIFFERENCES IN PRICES OF FIVE GRADES OF FEEDER STEERS AND HEIFERS DUE TO SELECTED FACTORS (1964-68)

Independent variable	Equation 2-10 Steers	Equation 2-11 Heifers	Equation 2-12 Combined
	— — — — Dollars per cwt — — — —		
Constant	27.0275	8.6457	24.2551
G_1, Prime	3.8186	3.2150	3.5954
G_2, Choice	2.6171	1.9106	2.2724
G_3, Good	.4718	.3182	.3860
G_4, Standard	— 2.0094	—1.5572	— 1.8110
G_5, Utility	— 4.8981	—3.8867	— 4.4428
X_1, Weight	— .0080	.0577	— .0072
	(6.34)	(4.14)	(7.40)
X_1^2, Weight Square	.00000063	— .00006383	.00000047
	(.61)	(4.58)	(.57)
ML_1, Amarillo	.4814	.1674	.3248
ML_2, Clovis	.2494	.4729	.3534
ML_3, Fort Worth	— .0072 NS	.1028	.0545 NS
ML_4, Oklahoma City	.1074	— .2941	— .0865
ML_5, Phoenix	— .7012	—1.0807	— .8908
ML_6, San Angelo	.2891	— .0739 NS	.0984 NS
ML_7, San Antonio	— .0599 NS	.3862	.1683
ML_8, Houston	— .3590	.3194	— .0221
Q_1, Jan., Feb., Mar.	— .2156	— .1600	— .1875
Q_2, April, May, June	.2495	.2661	.2533
Q_3, July, Aug., Sept.	.3162	.3842	.3464
Q_4, Oct., Nov., Dec.	— .3501	— .4503	— .4122
Yr_1, 1964	— 3.8542	—3.2508	— 3.6312
Yr_2, 1965	— 2.1478	—1.9436	— 2.1018
Yr_3, 1966	1.7209	1.4358	1.6242
Yr_4, 1967	1.7446	1.4513	1.6473
Yr_5, 1968	2.5365	2.3073	2.4615
X_2, Sex			2.4818
			(62.17)
S	1.333	1.209	1.339
R^2	.890	.877	.882
n	2769	2274	5043

The numbers in parentheses are t values associated with the estimate above each.

NS indicates the b values for discrete variables not statistically significant from zero at a probability level of at least 90 percent. However, the deleted variable's coefficient was not tested as its standard deviation was not part of the computer output. Within a group of discrete variables, the deleted variable is the last one of the group.

Source: Calculated from data obtained from the Market News Service, USDA.

APPENDIX TABLE 6. SUMMARY OF THE ESTIMATES OF DIFFERENCES IN PRICES OF GOOD AND CHOICE SLAUGHTER STEERS AND HEIFERS DUE TO SPECIFIED FACTORS (1964-1966)

Independent variable	Steers	Heifers	Combined
	— — — — Dollars per cwt — — — —		
Constant	17.0324	21.5194	20.3835
Grade	1.4949	1.3012	1.4283
	(12.28)	(8.33)	(15.00)
Weight	.0114	.0008	.0029
	(3.10)	(.13)	(1.15)
Weight Square	— .00000584	— .00000055	— .0000014
	(3.03)	(.15)	(1.06)
ML_1, Clovis	.1090 NS	.0451 NS	.1036 NS
ML_2, Fort Worth	— .2065	— .4943	— .3060
ML_3, Okla. City	— .0939 NS	— .0395 NS	— .0629 NS
ML_4, San Antonio	— .0138 NS	— .1508 NS	— .0194 NS
ML_5, Houston	.2052	.3379	.1459
Q_1, Jan., Feb., Mar.	— .8518	— .6476	— .7572
Q_2, Apr., May, June	— .1106 NS	.0166 NS	— .0532 NS
Q_3, July, Aug., Sept.	.7757	.6078	.7023
Q_4, Oct., Nov., Dec.	.1867	.0232	.1081
Yr_1, 1964	— 2.0894	— 1.8204	— 1.9689
Yr_2, 1965	.3513	.0437 NS	.2145
Yr_3, 1966	1.7381	1.7767	1.7544
Sex			.6237
			(7.34)
S	1.130	1.068	1.121
R^2	.737	.699	.719
n	459	381	840

The numbers in parentheses are t values associated with the estimate above each.

NS indicates the b values for discrete variables not statistically significant from zero at a probability level of at least 90 percent. However, the deleted variable's coefficient was not tested as its standard deviation was not part of the computer output. Within a group of discrete variables, the deleted variable is the last one of the group.

Source: Calculated from data obtained from the Market News Service, USDA.