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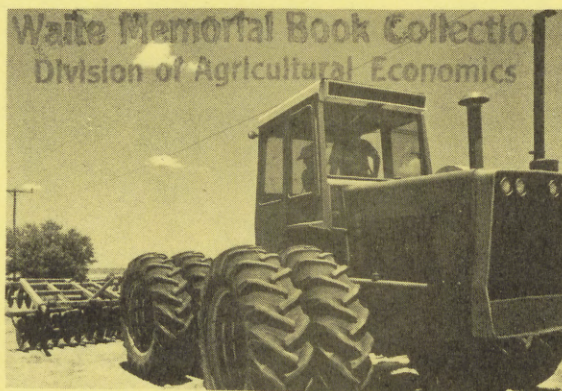


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"An Evaluation of Price Spread
and Cost Component Estimates
for Choice Beef and Pork"

by

Karen D. Parham and Lawrence A. Duewer
National Economics Division
Economics and Statistics Service
U.S. Department of Agriculture
Washington, D.C. 20250
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December 1980

AN EVALUATION OF PRICE SPREAD AND COST COMPONENT ESTIMATES FOR CHOICE BEEF AND PORK. By Karen D. Parham and Lawrence A. Duewer; National Economics Division; Economics and Statistics Service; U.S. Department of Agriculture, Washington, D.C. 20250. December 1980. ESS Staff Report No. AGESS801215.

ABSTRACT

Price spreads for beef and pork are a measure of the gross returns to the marketing firms involved. Comparison with cost estimates for marketing indicates the general level of the profits realized. Evaluation of cost and returns data provide public information on the efficiency and equity of the meat marketing sector. This report examines the history of price spread and cost component estimates, evaluates the accuracy and adequacy of the data, and suggests some alternative procedures. Available data allow some further improvement in estimating price spreads; but, more data are needed from marketing firms before cost components can be improved.

Keywords: beef price spreads, pork price spreads, price lags, cost components

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PREFACE

The Food and Agriculture Act of 1977 will expire in 1981. The new legislation will become the Nation's masterplan for agriculture until 1985. It could well influence the organization and operation of the food system for many years.

Along with the traditional concern over price and income policy, several new issues have emerged since 1977. Of particular significance are such matters as inflation, energy, conservation of our resource base, the increasing international role of U.S. agriculture, and the design and implementation of both domestic and international food assistance programs.

This report is a product of the ESS research agenda for the 1981 food and agriculture bill. It addresses the present methods of price spread and cost component analyses for beef and pork, describes historic trends in changes in price spreads, and suggests methods of revising and improving the availability, analysis, and accuracy of cost component data for beef and pork.

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SUMMARY

Farm-retail price spreads for Choice grade beef and pork are computed and reported by the Economics and Statistics Service as a measure of the gross returns to packers, processors, transportation firms, wholesalers, and retailers. They are used to monitor the changes in marketing charges over time, and to estimate profits realized by the marketing sector when compared with cost estimates. Since 1963, the real price spread for beef has increased 13 percent, for pork 24 percent.

These price spreads have been developed by the Department since 1920; estimates of marketing costs by component have been made since 1972. Since producers, consumers, and marketing firms have vested interests in the efficiencies and equity portrayed by these data, their accuracy is under constant scrutiny. Questions relating to the equitable distribution of consumer expenditures between industry participants following major price changes cause recurring examination of the data. The price spread data have been revised periodically; most recent major revisions were made in 1969 and 1978.

Cost component estimates have always been based on less data than optimum. This is partly because publicly available data is usually of an aggregate nature and often of the industry's own generation and even this data is in short supply. Such industry data may only be representative of a given industry subgroup. The procedure has usually involved a breakdown (proportional allocation of costs) of the price spread as opposed to building up (sampling) cost components from independent sources. Thus, it is difficult to evaluate the justification of the profits incorporated in the price spreads from existing cost data.

Charting price spread data indicates considerable variation--probably more than the variation in the price data used to generate the spreads. Part of this increased variation may be due to the residual nature of the spread--the difference between two price series. Ten separate patterns of movement between two price series can widen or narrow the spread between them. Since 1963, seven distinct increases in the level of the farm-retail price spread for beef and six for pork can be observed. Two of these increases in the general level of the spread have occurred for both beef and pork from mid-1978 to early 1980. These increases in price spreads have usually followed a sharp increase then decrease in farm prices.

Industry has always contended that the price data used to calculate the spreads should be lagged to reflect the movement of the meat through the market channel. Use of a 2-week lag between retail and carcass or farm level beef prices and a 4-week lag between retail and wholesale or farm level pork prices results in somewhat less variable price spread series.

Currently, price spreads are divided into cost components with industry profits being one component. Most data are industry estimates of aggregate costs, such as labor, etc., developed for accounting purposes, and may involve different species or activities. Two avenues of improvement of cost data are open. One is to collect cost data by

individual component through industry surveys or through other Government regulatory reports. The other is to generate synthetic cost data by building budgets for the different functions performed throughout the marketing channel. These budgets would be updated with current prices for the materials or services involved, and the proportions of these services utilized. However, the latter would still require considerable industry data for development of the initial cost coefficients in these budgets.

INTRODUCTION

Meat, specifically beef, pork, and poultry, is the most important food group in the consumer's food budget. Not only is it usually the most expensive item, but also, the quantity of meat consumed has increased gradually over the years.

Approximately 4 percent of total disposable income is spent on the purchase of red meats. Because of the importance of livestock to agricultural production and meat expenditures relative to total food expenditures, farmers, marketers, consumers, and policy makers have a keen interest in information on prices and price spreads for meats and other food items. These items represent either payments received for livestock by farmers, or prices paid for goods and services provided by processors and distributors to consumers. Changes that occur in prices and price spreads raise questions as to the equity to the consumer and the distribution of payment for livestock and marketing services.

The Department of Agriculture has monitored conditions in the red meat marketing sector since the early 1900's. As a measure of the gross returns received by packers, processors, transporters, wholesalers, and retailers of meat and other foods, price spreads have been computed and reported by the Department since 1920.

Retail prices of meat reflect the value of the live animal and the cost and profits for services provided in converting the live animals to the retail package of meat purchased by the consumer. The portion of the retail price of meat that is received by the farmer, processor, or other participant as payment constitutes their "share", a percentage sometimes interpreted as the cents received per dollar spent on meat by consumers.

Price spreads and the share statistic are a limited measure of gross returns in the meat industry. Spreads and shares are frequently misinterpreted and misused as the summary measure of the "well-being" of farmers or to indicate that marketing costs are excessive. Price spreads, however, provide a starting point in an attempt to evaluate the performance of the food industry. To determine whether or not price spreads are excessive, measures of efficiency and the persistence of excess profits earned by marketing firms must also be examined.

Objectives

The two objectives for this evaluation are: (1) to evaluate what has happened to price spreads over time; and (2) to evaluate the present procedures and available data sources used in computing cost components and to indicate what is needed to improve the analysis.

Objective 1, involves an historical review of the major trends in price spreads from their conception to the present. Patterns of changes in spreads are compared with farm, wholesale, and retail price levels,

changes in price levels, and production cycles to determine reasons for the step-like increases in price spreads over time. The relationship between price spreads and lags in price changes between channel stages will also be examined to determine whether the nonuse of lags has affected changes in spreads during short term periods in the past.

Objective 2, involves a description of the present method of estimating cost components. Also, the limited data presently available for estimating cost components is compared to what may be considered the ideal cost component information needed. Industry cost accounting and data needs determined from previous cost component analyses of price spreads will help in determining an ideal. Other possible data sources for cost information will be suggested.

Price Spreads and Price Levels

Price spreads for beef and pork are the differences between values at two market levels for a specific quantity and quality of product. To obtain comparable values at different levels for determining spreads, average composite retail meat prices must be compared with average values for an equivalent quantity of product (1 pound of retail cuts) sold at the wholesale and farm levels. Quantities at the farm and wholesale levels are increased by factors representing the weight loss during slaughtering, processing, and retail cutting. Average prices at each level are made comparable by pricing the same quality of meat at each market level. Beef prices and values represent Choice Yield Grade 3 beef. Pork prices and values represent average prices for barrows and gilts. Recent survey information indicates about 80 percent of barrows and gilts are U.S. No. 1's. An estimated value of byproducts not sold as meat cuts at retail such as hides, skin, and offals, is deducted from the gross farm value to obtain a net farm value comparable to the retail price for meat sold to consumers from the live animal. The wholesale value for beef (the carcass value) is an estimate of the value of the quantity of carcass beef equivalent to a retail pound. For pork, the wholesale value is an estimate of the value of wholesale pork cuts equivalent to a retail pound. A wholesale to retail byproduct value is derived for beef but not for pork as the beef wholesale value represents a hanging carcass while the wholesale value for pork represents a composite of cuts from a carcass.

Farm-retail price spreads are computed and reported by ESS as a measure of the gross returns received by the packers, processors, transporters, wholesalers, and retailers of beef and pork. The farm-retail spreads for beef and pork may be divided into two main components: farm-wholesale (or carcass) and wholesale-retail.

The beef farm-retail spread consists of the farm-carcass and the carcass-retail components. The farm-carcass spread includes approximate costs for procuring and slaughtering cattle, and transporting the dressed carcass to the city where it is consumed. The carcass-retail spread includes approximate costs for additional marketing services, such as

breaking carcasses, additional processing, wholesaling, delivery to local retail stores, as well as costs involved in retailing, such as cutting, packaging and stocking the retail case, and retailers' checkout and overhead costs. ^{1/}

The pork farm-retail spread consists of the farm-wholesale and the wholesale-retail components. The farm-wholesale spread includes approximate costs for procuring and slaughtering hogs, cutting the carcass, processing pork products, and shipping the products to the city where it is consumed. The wholesale-retail spread includes approximate costs for local delivery, wholesaling (which may involve further processing), and costs incurred during retailing of the pork products.

Using Price Spreads

Price spreads may be used to monitor changes in marketing charges over time, to analyze whether changes in gross margins are consistent with changes in marketing costs, and to aid in observing how retail prices respond to changes in farm price, supply, and to changes in consumer demand. As previously indicated, spreads alone do not measure the efficiency nor the inefficiency of an industry, nor do they measure profitability. Also, spreads alone are not measures of whether costs of marketing, processing, and distribution are reasonable or excessive.

Although the term price spreads is often used interchangeably with gross margins (often used by industry), these two terms have different meanings and should not be used as synonyms. Industry uses gross margin to mean the difference between what a retailer or packer gets for his product (per unit sold) and what he paid for it. Price spreads are usually reported in absolute terms, while gross margins are usually reported on a percentage basis (usually as a percentage of sales), although either way of measurement is correct for both price spreads and gross margins. Price spreads reported by USDA represent U.S. averages, whereas gross margins usually represent a limited number of companies or a single firm. Price spreads and industry gross margins are similar in that they both include costs of labor, packaging, and overhead, as well as any profit. However, price spreads are usually larger than meat packer and/or retailer margins, since costs of other minor marketing functions are included (particularly charges for transportation, assembly, and brokerage). Price spreads also represent a fixed combination of product while gross margins may vary in product proportions from one time period to another.

Price spreads alone can be used as gross indicators of the changes in costs and profits to firms in the marketing channel of doing business, but not as an indicator that marketing firms are or are not receiving excessive profits.

^{1/} While historically ESS has placed the breaking function in the carcass-retail spread, an increasing trend of the industry is for packers to vertically integrate forward and do a substantial share of the breaking at the slaughtering plant.

Cost Components of Price Spreads

Price spreads may be broken down into components which represent marketing costs. Analysis of cost components of price spreads was initiated partially as an attempt to analyze reasons for changes in the level of price spreads. Comparing the changes in the level of the price spreads with changes in the level of costs associated with each spread gives a better indication of whether the price spread values are justified based on the costs incurred or is it the result of an interaction of supply and demand at each level. Cost component analysis provides still another measure by which the activities of marketers and retailers can be monitored to better gauge the potential efficiency of the marketing system. Likewise, cost component analysis should be used in conjunction with other measures to form a more complete picture and not as a sole indication of whether price spreads are excessive or not.

The costs of marketing meat reflect changes in volume of business, economic conditions in the general economy (such as inflation), and technology. Estimates of cost components by USDA of beef and pork price spreads include labor, packaging, transportation, taxes, advertising, and profits in slaughtering and processing; transportation, total costs and profits for wholesaling and retailing. Cost component estimates are a proxy for the major operating expenses incurred by the industry. Although cost accounting by industry is more detailed, the cost estimates cover the basic components and provide a general estimate of costs.

Changes in Price Spreads

Price spreads change when livestock prices, wholesale prices, and retail meat prices change by different amounts. As costs increase for snipping, processing, and retailing meats, price spreads tend to widen over time. In the short run, price spreads generally fluctuate, widening when livestock prices fall and decreasing when livestock prices rise due partly to time lags in retail price and cost adjustments as the livestock and meat are moved through the processing and distribution systems. Also, livestock prices are more volatile than meat prices. Livestock prices are very responsive to fluctuations in marketings, but consumer resistance and competition encourages retailers to hold down the number of price changes at the retail level. Retailers tend to hold retail prices up during periods of declining wholesale prices and absorb some of the increase when wholesale prices increase.

Price spreads may widen, or narrow in other ways, or they may remain the same. Using the farm and retail price levels, spreads may change in the order listed in figure 1 from most likely to least likely for each type of spread change. They can also remain the same.

Figure 1. Possible Price Spread Changes

Price level	Spread			Price pattern
	Widens	Narrows	Same	
retail remains same farm decreases	X			
retail decreases farm decreases faster	X			
retail increases farm remains same	X			
retail increases farm increases slower	X			
retail increases farm decreases	X			
retail increases farm increases faster		X		
retail remains same farm increases		X		
retail decreases farm decreases slower		X		
retail decreases farm remains same		X		
retail decreases farm increases		X		
retail remains same farm remains same			X	
retail and farm in- crease at same rate			X	
retail and farm de- crease at same rate			X	

HISTORY OF PRICE SPREADS AND COST COMPONENTS ANNUALLY

Price spreads for beef and pork have been computed since the early twenties, when Congress asked the Department of Agriculture to undertake special studies of marketing margins (spreads) for livestock. In 1934, at the request of livestock producers, the Department developed a statistical series to measure changes in marketing costs for a number of agricultural commodities. In March, 1935, the Department published a preliminary report that summarized price spreads for beef, pork, and eight other important food products for 1910-34. In 1936, the Department issued a report on price spreads for 58 food items, including beef and pork. Since 1941, farm-retail price spreads for beef and pork have been published periodically. Spreads for beef are for U.S. Choice grade beef, and pork spreads are for barrows and gilts.

In 1945, the price spread series were revised extensively and a new series for 1913-44 was published for beef, pork, and lamb (along with other products). Procedures for computing price spread series have been updated periodically since that time with the last two major revisions occurring in 1969 and 1973. Updates are needed as industry practices and data availability change.

In addition to farm and retail prices and a farm-retail spread compilation for beef and pork, a middle or wholesale value was added dating back to 1949. It allows the division of the spreads into two components: farm-wholesale (carcass) and wholesale (carcass)-retail spreads.

When the middle-values (carcass and wholesale) between farm and retail were developed for beef and pork, the movement of beef to the retail level was predominantly in the carcass form. Pork movement to the retail level was in the form of wholesale cuts rather than carcasses. Thus, the present series use carcasses for beef and wholesale cuts for pork.

During recent years, more and more cutting of beef has been done prior to movement to the local retail store. This cutting has been done either by the packer or at a retail warehouse. The hotel, restaurant, and institution (HRI) accounts have always received more beef cuts than retailers, but they also have shown an increasing trend to buying portion control and frozen beef cuts. Price spreads reflect movements through retail stores, rather than HRI. W.R. Grace and Co.'s study of beef movement in 1977 indicated that 57 percent of all beef (excluding hamburger) entering retail stores is in primal or subprimal form. The Packers and Stockyards Division of the Agricultural Marketing Service (AMS) surveyed slaughterer-fabricators and fabricators of boxed beef and found that in 1977, 46 percent of all steer and heifer slaughter was boxed. This does not include beef fabrication by chain foodstore warehouses.

Thus, while the form of pork has not changed appreciably, beef has. If not now, boxed beef trends indicate it will soon be the predominant form of beef movement. Fabricated cuts are also increasing.

In order to examine other alternatives, both a primal value composite and a fabricated cut composite procedure was developed about 3 years ago. Data obtained from this procedure indicated that, although both composites were larger than the carcass value, neither value differed much from the carcass value (when compared on an equivalent weight basis). The fabricated cut value was the largest value as would be expected with the addition of more marketing services.

Several possible explanations could be made as to why the difference between the composites were not greater - including quality differences, the representativeness of price data available, and the valuation used for fat, bone, and trim. Therefore, when price spread procedures were revised in 1978, it was decided not to add a primal or fabricated cut value or change the carcass value to one of these series. This decision was based on the problems of obtaining accurate data and that adding to or changing would further complicate the beef price spread series.

The Market News personnel in AMS since 1978 have developed and are publishing a fabricated cut composite price for beef for the central U.S. region. They have the advantage in that they have market news reporters to collect prices for use in computing this series.

In view of this new data series, perhaps the question of adding to or switching the middle value in the beef spread series will be reconsidered when the next major revision is made in the series. A primal composite may be most appropriate and should replace the carcass value, rather than be an additional value.

Another approach is to compute all three composites (carcass, primal, and fabricated cuts) and weight them according to current movement to retail grocers.

If changes in the middle value are decided to be advantageous, they should be made as part of an overall package to update beef and pork price spread procedures rather than being added separately. If any changes are to be made, a prime concern should be how to provide a consistent series over time.

While spreads, as differences in the value between two market levels for the same quantity and quality of product, give an approximation of total marketing cost between levels, they do not break down these differences into cost and profit components. Congress appropriated additional funds (\$100,000) to the Department of Agriculture in fiscal year 1974 for research to provide information on cost and profit components of spreads. Estimates of 12 components of spreads at various marketing levels were begun for beef and pork (and other commodities).

Cost components were estimated for 1972 and estimates have been made for each year since. These estimates use all available data, but in many cases there has not been enough detailed data available. Components have been forced to add to the spreads while maintaining the same proportions. Due to changes in data availability the estimates for the different years are not strictly comparable.

The main source of data for the farm-carcass (wholesale) cost components has been from a survey of meat packers conducted by Food Management, Inc. during 1974. USDA contracted with Food Management, Inc. to obtain this data. For later years, indexes have been used to update these data. Retailing cost components have not been published in recent years due to insufficient data. For earlier years, several sources of data were combined to obtain cost components for the retailing level. Data included time and motion meat cutting data from Case and Co., Inc., results of a survey of space allocations within a retail store, and materials on costs obtained from Super Marketing Institute (now Food Marketing Institute) and Cornell annual studies of operating results of food chains.

Historically, beef and pork price spreads have been increasing. The farm-retail spreads for beef and pork have nearly tripled from 1963 to the present. In 1963 the farm-retail spread for beef averaged 30.0 cents and in 1979 the average was 85.5 cents. For pork, the average in 1963 and 1979 respectively was 26.4 cents and 77.5 cents. Price levels as well as spreads also increased. The retail price of beef in 1963 was 80.4 cents compared to 226.3 cents in 1979. For pork, retail prices increased from 55.9 cents to 144.1 cents.

Inflation has played a major role in spread increases over time. Real retail prices and price spreads as measured by deflating by the CPI (1967=100) for all items are as follows:

Item	Beef		Pork	
	1963	1979	1963	1979
	<u>Cents</u>			
Farm-retail spread	30.0	85.5	26.4	77.5
Deflated: All items	33.0	39.3	28.8	35.6
Retail price	80.4	226.3	55.9	144.1
Deflated: All items	87.7	104.1	61.0	66.3

The real price of beef and pork increased which means beef and pork were more expensive in 1979 than in 1963. Real price spreads increased 19 percent for beef and 24 percent for pork from 1963 to 1979.

BEHAVIOR OF PRICE SPREADS
Step-like Increases in Price Spreads

A step-like pattern of increases in price spreads has appeared over the years (see figure 2). The carcass-retail spread steps for beef are much more apparent than those for the farm-carcass spread. The only step increase identified during the 1963-79 period for the farm-carcass spread occurred in mid-1973. Step increases in the beef carcass-retail spread occurred in May 1969, January 1972, August 1973, September 1975, May 1978, and January 1979.

A similar situation occurred for pork (see figures 3 & 4). The farm-wholesale spread for pork was much less step-like than the wholesale-retail spread. Three levels were identified for the farm-wholesale spread, but the first two are upward sloping steps. The

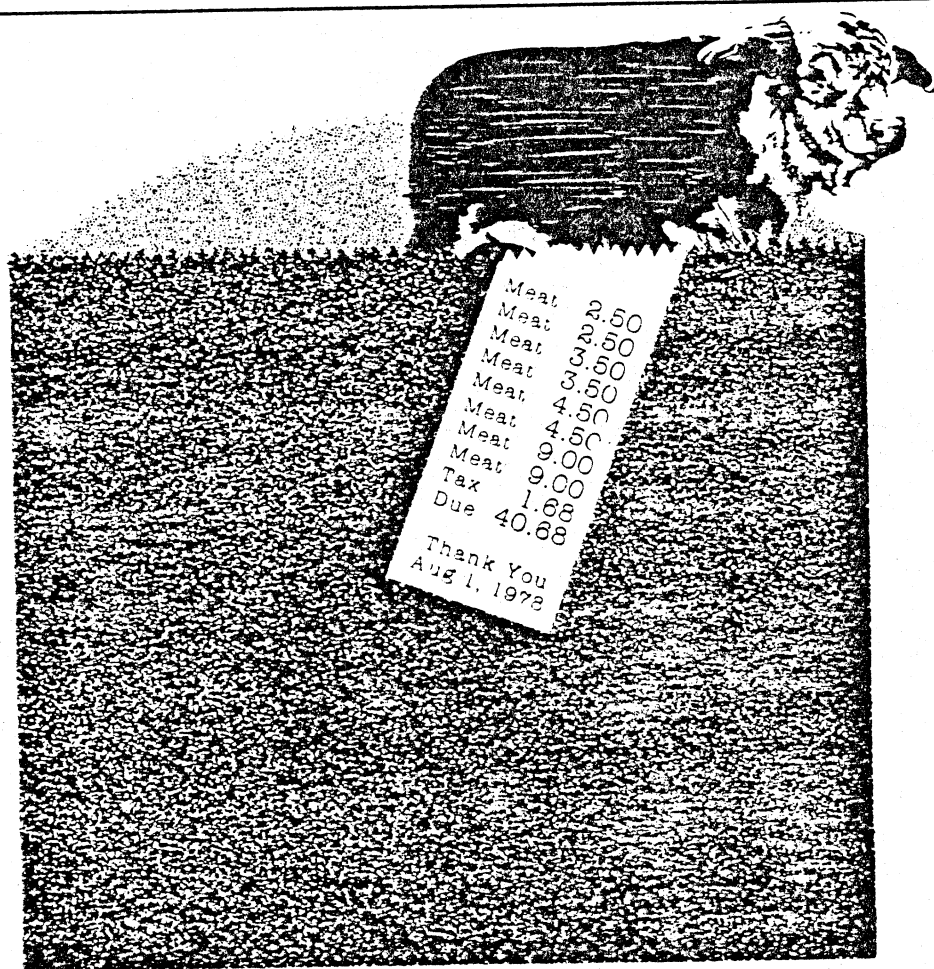


FIGURE 2. BEEF - COMPONENTS OF FARM-RETAIL PRICE SPREAD

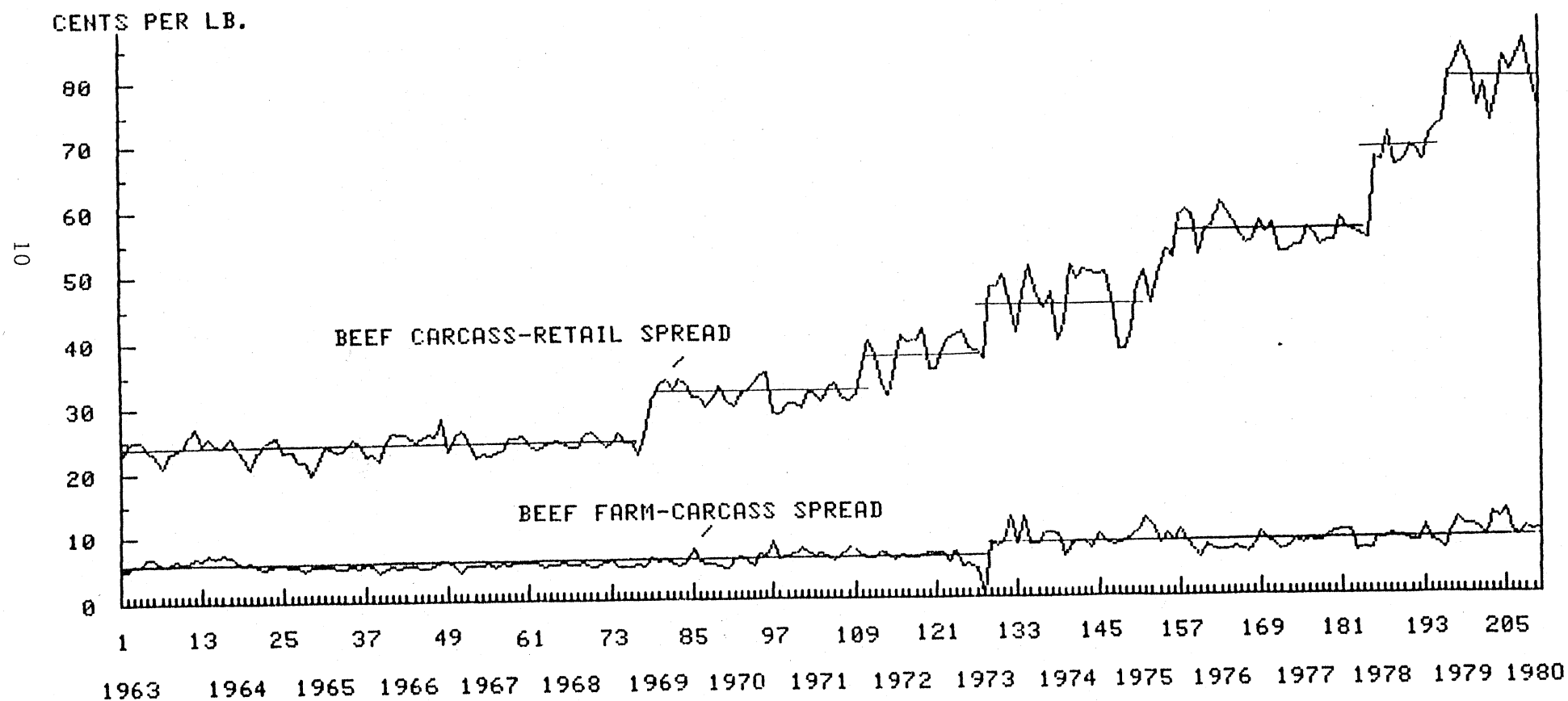


FIGURE 3. PORK - COMPONENTS OF FARM-RETAIL PRICE SPREAD

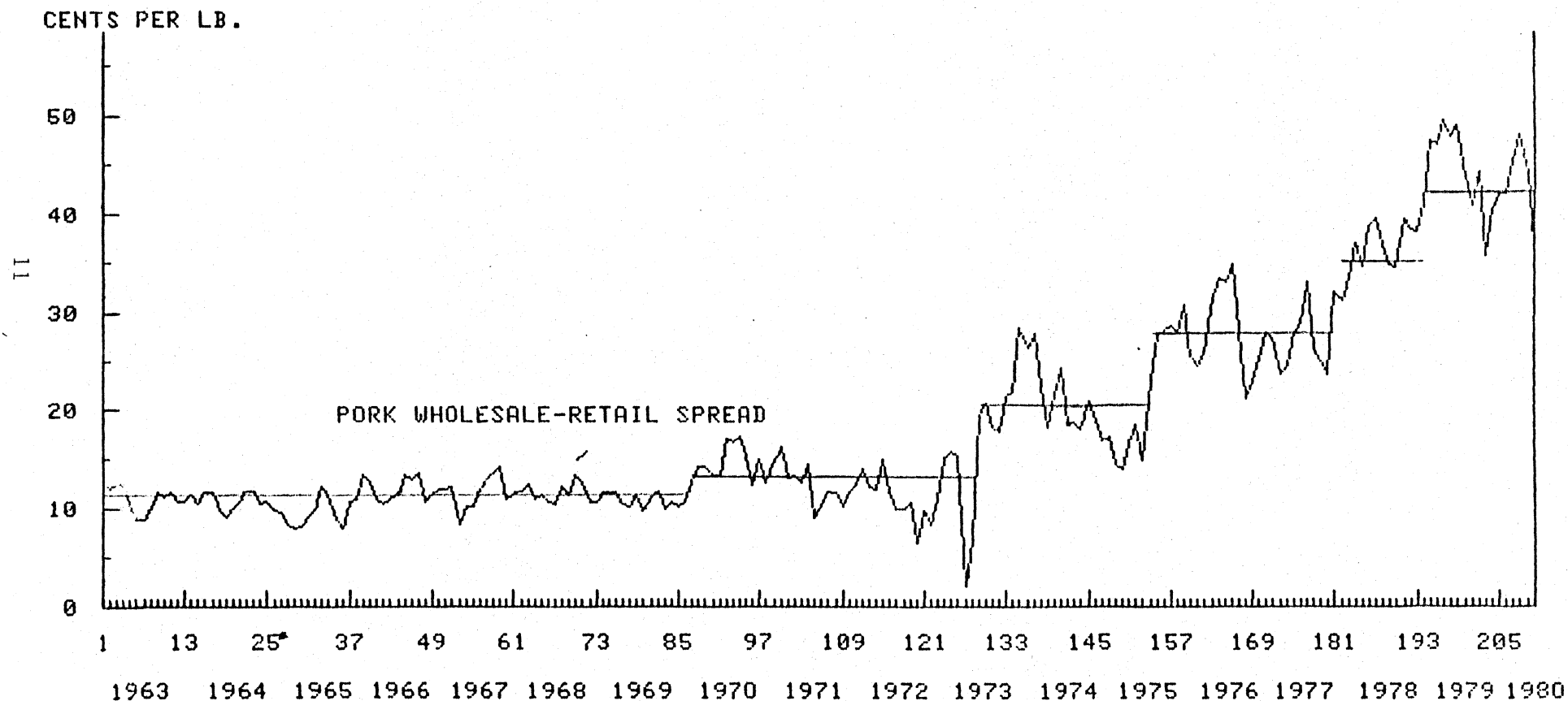
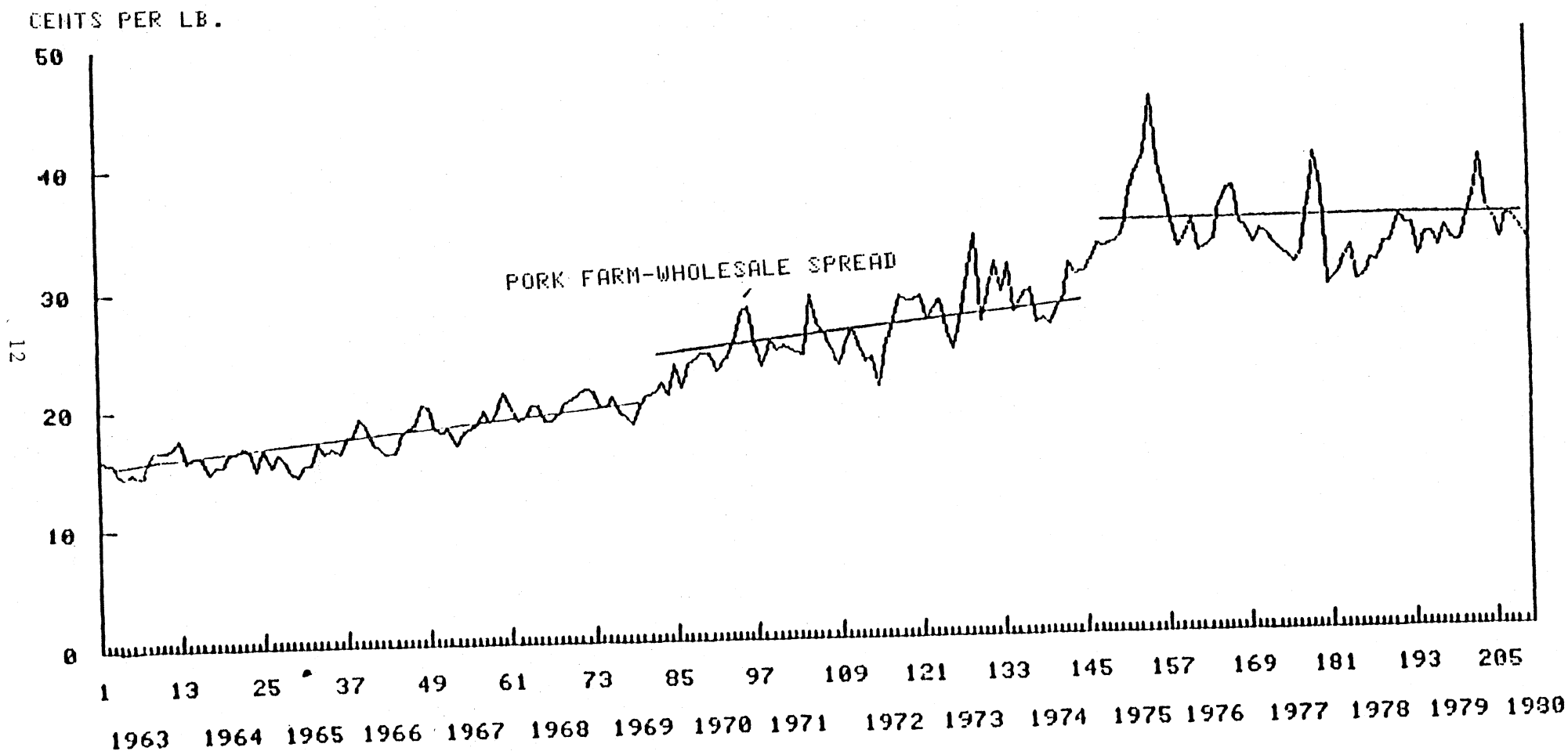


FIGURE 4. PORK



fact that the farm-wholesale spread does not seem to have increased since mid-1975 is most interesting in light of recent inflationary pressures on input costs. Since 1963, pork production and consumption hit an all time low in 1975. Thus, pork packers and processors (which had overcapacity already in earlier years of higher production) were allocating their fixed costs over a smaller kill. As production increased to the high level of 1980 the spreading of fixed costs may be the reason farm-wholesale spreads have not increased since 1975. Step increases in the pork wholesale-retail spread occurred in March 1970, September 1973, September 1975, January 1978, and January 1979.

When price levels are examined relative to these increases in spreads it is found that the increases usually occur after a period of increasing farm level prices when prices stabilize or decrease. The explanation is merely that retailer profits have been squeezed as they have tried to hold prices down (or just lagged in their price increases) and they use the stability or decrease in prices as a means to widen their spreads. The widening is both to recoup their profits and to catch up with the inflation in their costs since the last step increase. Competition keeps the price spread in line as retailers are reluctant to increase prices for the fear of losing business as competitors hold or cut prices.

A comparison of the timing of step increases in beef vs. pork spreads indicates that the increases are similar. About the only difference was an additional increase for beef beginning in January 1972. Pork consumption dropped in 1972, while beef consumption increased. Prices for both beef and pork increased in 1973. The hypothesis, thus, could be that the short supply of pork and resulting higher prices caused beef prices to rise and widen spreads. The overall similarity of beef and pork price spread step increases supports the substitutability of beef and pork. The interaction of supply and demand cause the resulting price changes and spreads for beef and pork to bear similar relationships because if one meat is in short supply or too expensive a certain amount of purchases are shifted to the other meat.

Time Lag Relationships Between Prices and Price Spreads

Retail meat price changes typically lag behind livestock price changes by several weeks. This is due partly to the physical time that it takes for the animal sold at the farm level to reach the consumer. Presently, concurrent prices or values at each market level are compared in determining price spreads in the beef and pork price spread series as opposed to comparing, for instance, the current retail price with the farm or wholesale value for an earlier period. In the past this has not been done for several reasons. It is difficult to determine the time span required to lag the farm price. Studies have reported varying lagged periods and no specific time lag at this point has been determined. Generally, research has shown that price changes at the farm level are transmitted to the carcass level with a very short lag--usually one week or less. This farm price change may reach the retail level in about 2-3 weeks for beef and about 3-4 weeks for pork, or longer, depending on the amount of processing involved.

Tables 1 and 2 show average monthly prices and price spreads for the period of January 1979 through July 1980 presently reported for beef and pork, respectively, as compared to prices and price spreads as they would be if the farm and carcass (wholesale) values were lagged. For beef, the farm and carcass values are lagged two weeks (considering little or no processing is involved), then the monthly value is estimated at both levels and is compared to the retail value for the month.

The beef farm-carcass spread is basically the same under the two methods except during February, July, October, and November, when the two spreads move in opposite directions (see figure 5). The average annual spread in 1979 is about the same for lagged and published prices.

The beef carcass-retail spread, with lagged values, was higher from January to April in 1979 than the published spread. From September 1979 until March of 1980, both spreads moved in opposite directions. The carcass-retail spread in both cases fell from April through July 1978, however, the spread based on lagged values was at a higher level. The beef carcass-retail spread averaged 77.1 cents in 1979 with lagged farm and carcass values compared to the published spread which averaged 75.8 cents.

The average annual beef farm-retail price spread in 1979 was 86.7 cents per retail pound based on lagged values, and the published spread was 85.5 cents. It may be more appropriate for short run analyses to estimate price spreads by comparing the retail price with lagged farm and carcass values instead of the concurrent values at the farm and carcass levels. ^{2/}

Pork farm and wholesale prices were lagged four weeks and compared to retail prices from January 1979 through July 1980. The four week lag was chosen to account for processed products. The level of the pork farm-wholesale spread is similar whether prices are lagged or not, however, as figure 6 shows, since February until September of 1979, the two spreads moved in opposite directions. From September to June of 1980 the farm-wholesale spread based on lagged values followed basically the same pattern as the published spread only occurring a month later. In July of 1980, however, the lag based spread continued to fall, while the published spread increased.

The wholesale-retail spread for pork does not show variations as wide when the farm and wholesale values are lagged when compared to the published spread. From August until December of 1979, the two spreads moved in opposite directions. From December 1979 until February of 1980, the wholesale-retail spread based on lagged values remained stable, while the published spread increased in January and then leveled off in February at a higher level. There is a distinct difference in this

^{2/} Fitting a trend line to current and lagged values of price spreads for beef resulted in R^2 (the coefficient of determination) values of .18 and .23 at the farm-retail level; .14 and .16 at the carcass-retail level; and .13 and .14 at the farm-carcass level, respectively. At each level, the variation in estimates of price spreads based on lagged farm and carcass values are reduced slightly when compared to price spreads based on concurrent values.

Table 1--Choice Beef: Retail value, current and lagged (2 weeks) carcass, and farm values, spreads, monthly

Year	Retail price	Carcass value		Farm value		Farm-Retail Spread					
						Total		Carcass-retail		Farm-carcass	
		Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged
1979											
Jan.	204.9	138.5	130.0	128.1	120.8	76.8	84.1	66.4	74.9	10.4	9.2
Feb.	215.3	145.0	141.8	137.0	131.9	78.3	83.4	70.3	73.5	8.0	9.9
Mar.	225.9	154.6	149.3	146.8	140.9	79.1	85.0	71.3	76.6	7.8	8.4
Apr.	232.8	160.4	156.8	153.6	149.8	79.2	83.0	72.4	76.0	6.8	7.0
May	240.2	160.4	163.8	150.5	155.4	89.7	84.8	79.8	76.4	9.9	8.4
June	233.6	152.4	154.5	140.9	145.2	92.7	88.4	81.2	79.1	11.5	9.3
July	232.2	148.0	152.8	137.6	140.4	94.6	91.8	84.2	79.4	10.4	12.4
Aug.	220.9	139.9	139.2	129.5	128.6	91.4	92.3	81.0	81.7	10.4	10.6
Sept.	226.6	151.8	149.5	142.1	140.1	84.5	86.5	74.8	77.1	9.7	9.4
Oct.	224.3	145.9	150.9	137.0	140.4	87.3	83.9	78.4	73.4	8.9	10.5
Nov.	226.2	153.8	146.2	141.8	137.0	84.4	89.2	72.4	80.0	12.0	9.2
Dec.	232.6	155.7	155.3	144.3	144.2	88.3	88.4	76.9	77.3	11.4	11.1
1980											
Jan.	234.5	152.1	156.5	139.4	143.1	95.1	91.4	82.4	78.0	12.7	13.4
Feb.	234.8	154.6	150.0	145.0	138.2	89.8	96.6	80.2	84.8	9.6	11.8
Mar.	236.2	153.9	155.9	145.1	146.8	91.1	89.4	82.3	80.3	8.8	9.1
Apr.	233.3	148.2	148.2	138.2	138.6	95.1	94.7	85.1	85.1	10.0	9.6
May	230.4	152.2	150.8	142.7	141.6	87.7	88.8	78.2	79.6	9.5	9.2
June	230.6	156.4	153.2	146.1	143.2	84.4	87.4	74.2	77.4	10.3	10.0
July	235.8	163.6	161.4	152.6	150.3	82.9	85.5	71.9	74.4	11.0	11.1

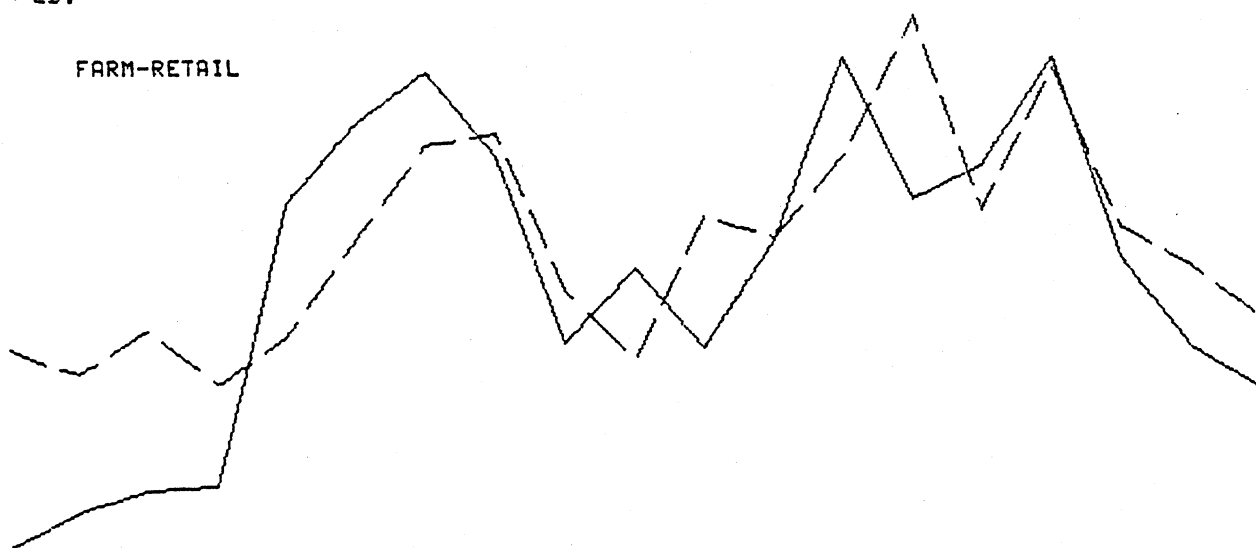
Table 2--Pork: Retail value, current and lagged (4 weeks) carcass, and farm values, spreads, monthly

Year	Retail price	Wholesale value		Farm value		Farm-Retail Spread					
						Total		Wholesale-retail		Farm-wholesale	
		Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged
1979											
Jan.	154.2	116.0	112.2	82.4	78.5	71.8	75.7	38.2	42.0	33.6	33.7
Feb.	157.1	116.0	116.0	85.0	82.4	72.1	74.7	41.1	41.1	31.0	33.6
Mar.	156.9	109.4	116.0	76.5	85.0	80.4	71.9	47.5	40.9	32.9	31.0
Apr.	150.7	103.8	109.4	70.9	76.5	79.8	74.2	46.9	41.3	32.9	32.9
May	149.3	99.9	103.8	68.2	70.9	81.1	78.4	49.4	45.5	31.7	32.9
June	144.5	96.7	99.9	63.2	68.2	81.3	76.3	47.8	44.6	33.5	31.7
July	142.4	93.4	96.7	61.1	63.2	81.3	79.2	49.0	45.7	32.3	33.5
Aug.	135.9	92.0	93.4	59.8	61.1	76.1	74.8	43.9	42.5	32.2	32.3
Sept.	135.6	94.8	92.0	60.5	59.8	75.1	75.8	40.8	43.6	34.3	32.2
Oct.	134.3	90.1	94.8	54.1	60.5	80.2	73.8	44.2	39.5	36.0	34.3
Nov.	132.2	96.5	90.1	57.2	54.1	75.0	78.1	35.7	42.1	39.3	36.0
Dec.	136.3	95.6	96.5	60.7	57.2	75.6	79.1	40.7	39.8	34.9	39.3
1980											
Jan.	135.3	93.3	95.6	59.1	60.7	76.2	74.6	42.0	39.7	34.2	34.9
Feb.	133.2	91.3	93.3	59.0	59.1	74.2	74.1	41.9	39.9	32.3	34.2
Mar.	133.3	88.0	91.3	53.6	59.0	79.7	74.3	45.3	42.0	34.4	32.3
Apr.	127.8	79.7	88.0	45.6	53.6	82.2	74.2	48.1	39.8	34.1	34.4
May	123.6	79.5	79.7	46.6	45.6	77.0	78.0	44.1	43.9	32.9	34.1
June	124.4	87.6	79.5	55.5	46.6	68.9	77.8	36.8	44.9	32.1	32.9
July	135.0	101.5	87.6	68.2	55.5	68.0	79.5	34.7	47.4	33.3	32.1

URE 5. BEEF-PRICE SPREADS WITH FARM AND CARCASS
VALUES LAGGED 2 WEEKS

PER LB.

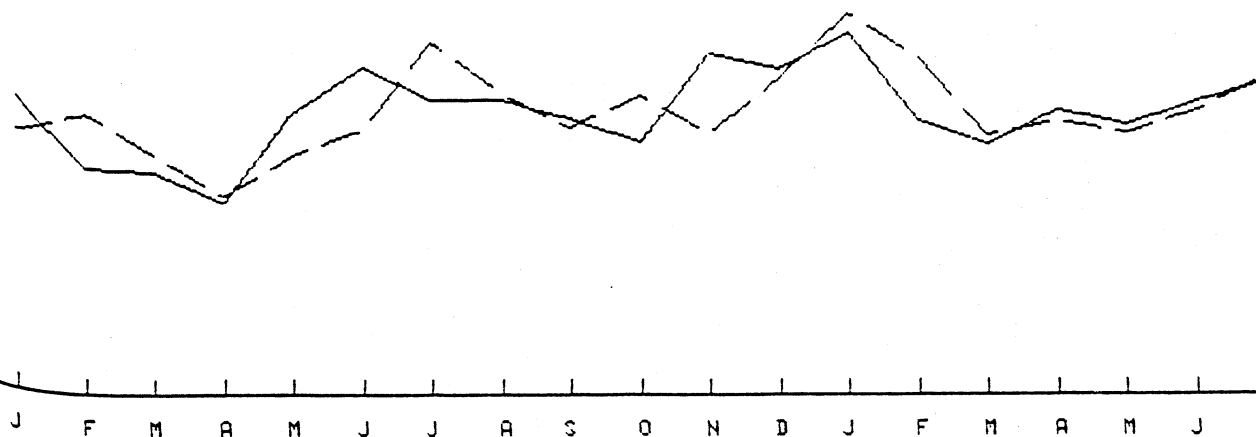
FARM-RETAIL



CARCASS-RETAIL



FARM-CARCASS

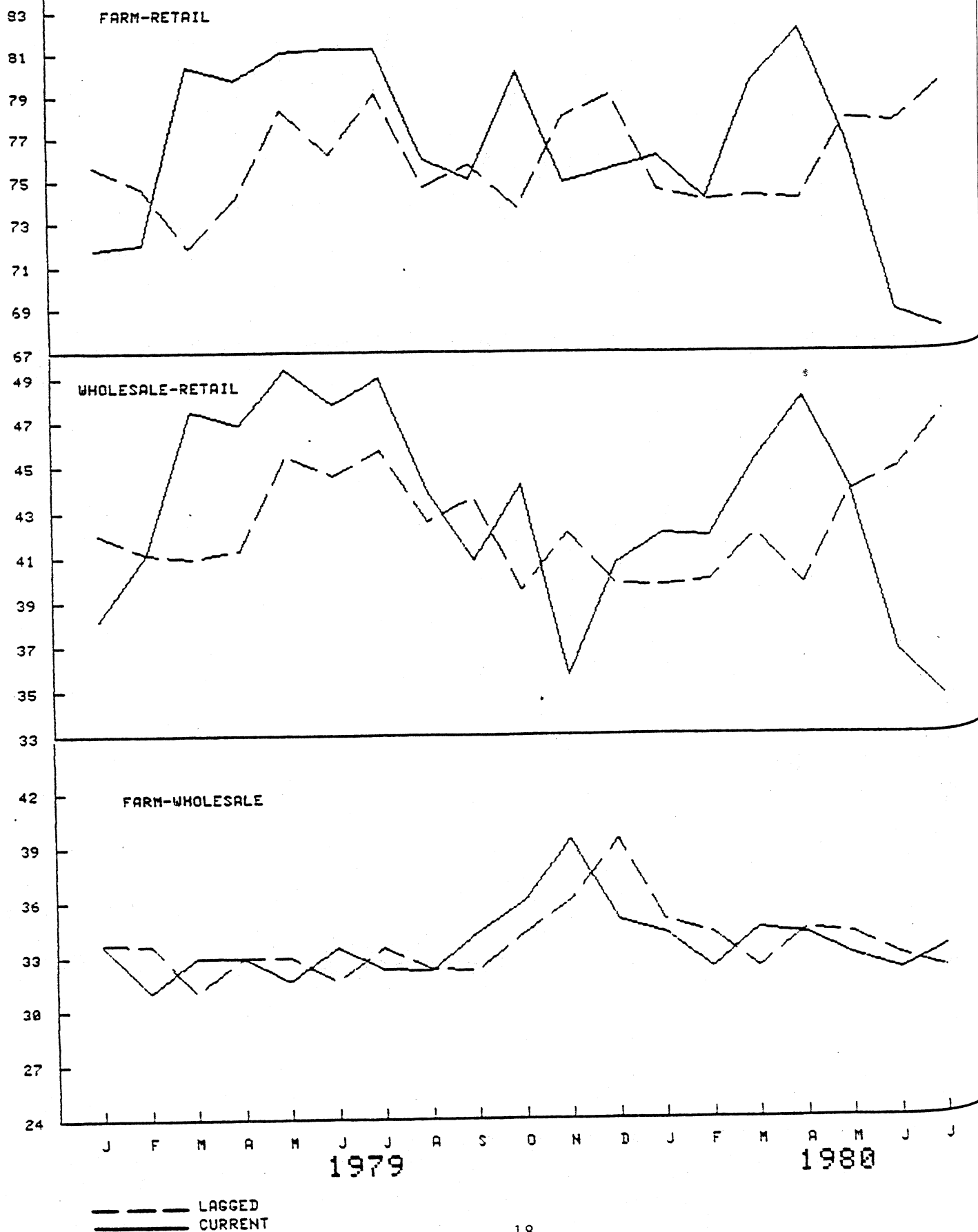


J F M A M J J A S O N D J F M A M J J
1979 1980

LAGGED
CURRENT

FIGURE 6. PORK-PRICE SPREADS WITH FARM AND CARCASS
VALUES LAGGED 4 WEEKS

CENTS PER LB.



spread from March through July 1981, where the spread decreases from March to April and increases continuously through July when lagged values are used. The published wholesale-retail spread increases from March to April and then decreases continuously through July.

The pork farm-retail spread based on lagged values averaged 76 cents per retail pound in 1979 compared to 77.4 cents for the published spread. The farm-retail spread based on lagged values was basically stable at about 74.3 cents from January through April 1980 when the spread increased in May to 78 cents, decreased slightly in June to 77.8 cents, and increased again in July to 79.5 cents. The published farm-retail spread decreased from 76.2 cents in January 1980 to 74.2 cents in February, then increased in March and April to 79.7 cents and 82.2 cents, respectively. ^{3/}

USDA price spreads have been criticized by industry as being nonrepresentative as a measure of margins for several reasons. One reason is the fact that price spread estimates do not take into account time lagged prices between purchase and sale. Also, each of the firms which participate in the marketing process must make some profit to remain in business. These firms explain that a target or "normal profit" level is an objective of the firm, therefore, it may be expected that small variations in the monthly price spread would occur from month to month. If time lagged price spreads are more representative of industry margins, changes in these spreads will reflect a truer picture of the effects of competition, changes in supply, demand, and other factors on prices.

COST COMPONENTS Present Sources and Analyses

Presently, cost components for beef and pork are determined by dividing the farm-retail price spread into costs representing the farm value, assembly of live animal, slaughtering, wholesaling, and retailing. This breakdown of the farm-retail spread for meats and other products is reported annually by USDA in the publication *Developments in Marketing Spreads for Food Products*.

Costs for slaughtering are broken down further into 12 major categories: labor, packaging, transportation, business taxes, depreciation, rent, repairs, advertising, interest, energy, profit before taxes, and other. Cost estimates at the wholesaling level are broken down to intercity transportation and intracity transportation.

^{3/} Fitting a trend line to current and lagged values of price spreads for pork resulted in R^2 (the coefficient of determination) values of .08 and .09 at the farm-retail level; .12 and .02 at the wholesale-retail level; and .04 and .05 at the farm-wholesale level, respectively. At each level except the pork wholesale-retail level, the variation in estimates of price spreads based on lagged farm and wholesale values are reduced slightly when compared to price spreads based on concurrent values.

An improved source of cost information may be a budget generator (a computer program) which uses data obtained through cost synthesis (an economic-engineering technique). Using different variables, for example, plant size, number of head slaughtered, etc., for a slaughtering plant, budgets could be developed for various plant sizes and geographic regions. Ideally, budget generators could be developed for each marketing level.

Research to develop costs for beef slaughtering and processing was made by James H. Cothorn, an extension economist at the University of California, Davis. An economic-engineering technique of cost synthesis was used. This process divided slaughtering and processing into separate operations and further subdivides each operation into stages. Costs are then allocated by stage of operation in two categories: 1) investment, overhead, or fixed costs; and 2) operating or variable costs, to determine the cost structure. Use of this technique, which requires considerable data input, is a possible source of more accurate cost estimates.

Developing a budget generator particularly at the retail level would involve identifying specific operations at the retail level and allocating costs to each operation. This is difficult for several reasons. First, the components in the retailing level must be determined. Since store costs are usually not broken down to those incurred by the meat department alone, a problem arises as to how overhead costs are to be allocated to the meat section. A basic problem exists that industry may not have adequate data (or may not release data) on costs incurred by the meat department only, therefore, weights may be needed to allocate total store costs to the meat department and beef and pork only. Furthermore, costs which may be variable for the total store, such as checkout labor, are not variable when only considering the meat department. Presently, price information is collected from a representative number of grocery chains and is used to develop price spread data. It would be helpful in developing retail cost components if grocers also volunteered cost information by department. However, retailers have a variety of methods used in cost accounting and much work would be involved in aggregating cost information received. Research has already been conducted for beef retailing where economic-engineering (technique such as a time and motion study) and capital budgeting were used to evaluate the potential impact of alternative beef-handling systems (systems for moving beef from packer to consumer) on beef distribution costs.

Cost components of wholesaling have been and are the weakest link in the whole cost component computation procedures. No attempt has been made to estimate individual wholesaling costs. The total wholesaling cost has only been a rough estimate based on data reported in the 1972 Census of Wholesale Trade indicating that meat wholesaling costs were around 7.5 percent of sales at wholesale. There are essentially two types of operations that fall in the wholesaling classification. One of these is the grocery wholesalers, a firm that buys in large quantities and then sells smaller quantities to retail stores. These wholesalers

may be cooperatives, affiliated, or independent firms. The other type of operation is the retail chain division's warehouse which buys, warehouses, and then distributes products to the chain's local stores. The second is merely the chain running its own wholesaling operation.

The needs for cost components information for wholesalers is the same as that needed for packers and retailers. Measurement of the spread or gross margin attributed to this part of the channel is needed, along with labor, transportation, packaging, and other cost estimates.

All possible secondary data would need to be obtained. This includes information from the Census of Wholesale Trade, trade magazines and other sources. However, timeliness and representativeness limit the results of this approach to cost component analysis. A survey of a sample of wholesalers (both types) would provide the most data and the data most nearly adapted to our needs.

Current Analysis

Each month a report is prepared for internal use which compares changes in price spreads and estimated marketing costs for beef and pork. The procedure currently used to develop cost indices is a regression technique designed to enable monthly price spreads between the price levels to be compared with estimates of the price spreads based on changes in various major cost items. The monthly cost indices are based on data obtained primarily from the Bureau of Labor Statistics. The indices are weighted and summed to determine a monthly composite farm-carcass cost index for beef and a composite farm-wholesale cost index for pork. The monthly composite cost index used for the beef carcass-retail level and the pork wholesale-retail level is the food wholesaling-retailing index. The composite farm-retail cost index for beef and pork is finally determined by weighting the farm-carcass (wholesale) and carcass (wholesale)-retail composite cost indices.

The price spread is regressed on the composite cost index to derive an estimate of the spread (the \hat{Y}) as a function of the cost index. A 4-year (48 month) period (1976-1979) was selected as a period for which excess profits, if any, should average out with short term losses. The functions are reestimated every two or three months, adding two or three new observations and deleting a similar number of the oldest observations. This procedure was originally developed to more accurately determine whether short term levels of price spreads were justified based on the costs incurred at each market level. It indicated a lower "cost-justified" estimate for pork (especially for the farm-wholesale component) and increased the estimate for beef in comparison with the earlier method used.

Improving Cost Component Analysis

The process of estimating composite cost indices and comparing price spreads with spreads based on costs (regression technique) was one option attempted to improve cost component analysis and to make estimates more current. Another possible vehicle for this cost information is through

the Packers and Stockyards Division (P&S) of the Agricultural Marketing Service (AMS). Packers and processors of meat products are currently responsible for filing an annual report with this division. Some of the information collected is an account of the operating expenses incurred by the company. These expenses include costs for manufacturing, advertising, sales promotion, sales brokerage, other selling expenses, delivery, general and administrative, depreciation and amortization, interest, and other expenses. The report also asks for profit information, which has always been a difficult value to determine in the past. In current cost component procedures, profit is a residual value based partly on a consideration of profits reported in the American Meat Institute's, "Annual Financial Review." With the addition of a few more cost items, such as: procurement labor; direct labor for slaughter, offal, and carcass cut-up; packaging; supplies; utilities; and several others, information reported to P&S would be very beneficial. The P&S report is confidential and mandatory, therefore, it may be difficult, not only to get firms to summarize any additional information, but also to be willing to volunteer additional information on their costs. However, estimation of current values would still be necessary because of the lag in filing of the reports with P&S.

It may also be possible for ESS to work in conjunction with AMS-P&S to conduct a separate survey to collect additional slaughter plant cost data. AMS-P&S needs estimates of slaughter plant costs to evaluate packer business operations, and this information would be useful to ESS to develop cost coefficients for slaughter plant budgets and aid in refining estimates of cost components of price spreads.

Data might also be collected through surveys done jointly with the American Meat Institute (AMI) which presently reports operating expenses as a percentage of total sales and other financial information of meat packers and some meat processors, and the Food Marketing Institute (FMI) which in the past has collected information on the operating expenses of food chains.

However, the uses of cost component information may vary between these trade associations and government. Because of this, willingness of the trade associations to contribute may be limited, requiring that the other methods described be used instead.

There are many problems faced in developing a procedure for estimating cost components. The major concern is the lack of cost data available at all market levels. Most firms do not have the records to provide the data needed. Data kept by some firms for management, accounting, taxes, and other purposes would require supplemental data and some adjustment for differences in accounting procedures for cost component analysis. It is necessary, not only that better cost data be collected and recorded by all involved in the meat industry, but also that the industry be willing to share this information with USDA. Furthermore, the industry has not been convinced of the need for such information. Cost components seem to be viewed as unnecessary or nonrepresentative by the industry and this has limited such information

for research purposes. Firms have also cited confidentiality of data as a reason for not furnishing some of the data sought since they fear that information on their costs and profits may be used against them in legal actions.

POLICY IMPLICATIONS CONCERNING ANALYSIS OF PRICE SPREADS

In the public concern over rising food prices, whether they are just or unjust, much attention is focused on the price spreads between specific pricing points in the marketing channel. Both rising prices and increased price spreads serve as valuable first indicators or warnings that the food marketing system has either temporary or longer-term problems in providing marketable services at reasonable costs.

Given the signs that prices and price spreads are increasing, the public or those parties acting for the public need to analyze the marketing system further as to its ability to adjust, what the causes of increases are, and whether they are permanent or temporary. If a condition is temporary and will correct itself in a reasonable period of time, there is no need for intervention by public authorities, but merely calls for placing the system under closer observation.

How does one analyze such related information as to whether price and price spread changes are necessary? Generally, economists have looked at analytical variables to help them classify or analyze the market system according to three general concerns: (1) the structure of the system, (2) the conduct of the system's participants, and (3) the performance of the system. While disagreement may exist as to the relative strength of the relationships between structure, conduct, and performance, each contributes to our understanding of the performance of the marketing system.

Costs have always been a widely used variable for relating prices to price spreads. If costs increase, then revenues as represented in the price spread may also need to increase if the firm is to remain in business over the long run. However, the use of technology, improved management, economies of size, etc. would not always require an increase in the spread for long term profitability. The cost component series of price spreads is an attempt to delineate the costs associated with the change in price spreads when compared to a previous time period. However, cost components fail to explain what price level is socially desirable.

If spreads increase and an industry is competitive, we can expect the competitive process to reflect only rising cost over all but the shortest

time span. 4/ Any short term excesses would be eliminated as easy entry allows additional competitors to enter and reduce the profits. Eventually, unnecessary cost would be eliminated from the system as the inability for a firm to change its terms of trade with its customers would lead it to minimize its costs in attempting to maximize its profits. Therefore, the competitive firm exploits whatever economies of size that exists, in turn placing pressure on other firms which are less efficient. Non-competitive firms may not be much more profitable, or they may be able to indulge in less efficient practices as market forces are slower to respond because of the less competitive conditions.

Profits may remain higher for longer periods than for more competitive industries. Consequently, for a competitive market segment, profit rates will not be excessive for other than very short periods of time due to rapid change in supply and demand conditions which tend to move the industry back to average rates of return. Furthermore, spreads should approximate costs. For the non-competitive market segment, less efficient practices and/or profit should persist for longer periods of time.

During the past 17 years (1963-1979), farm-retail price spreads for beef have averaged 36.3 percent of the retail price with an increasing trend of an additional 0.1 percent per year. The major growth in spreads has occurred in the carcass-retail price spread. For the same period, carcass-retail price spreads averaged 84 percent of farm-retail price spreads. This average increases half a percentage point per year. In 1979, the carcass-retail price share of the total price spread averaged 83.7 percent. Clearly, an area for further examination of the general growth in price spreads would be in the distribution function. Questions that need to be answered--are there competitive imbalances, has the product or service undergone a significant change, or has the cost structure been significantly altered, and if so, why? All these questions would need to be considered before concluding, on the basis of price spreads alone, that returns to distributors are or are not the result of good market performance.

Pork spreads have exhibited a similar trend to beef spreads. The marketing system has taken an ever increasing share of the retail price. Also, the wholesale-retail price spread has grown faster than the farm-wholesale spread, thereby increasing its share similar to beef (although the share is smaller for pork).

4/ Theoretically, in judging structure, conduct, and performance, a model of pure competition is used. While a purely competitive state is never totally attainable, it is useful to see how close a given industry or market segment approximates it. One rule which flows from the purely competitive model is whether industry price equals the industry's marginal cost which equals its minimum average cost. This situation is caused by competition among large numbers of buyers and sellers which eliminates excess profits. This rule, plus the degree of barriers to entry, such as size, technology, capital requirements, and product differentiation are all elements to look at in determining the competitiveness of an industry.

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