TIME SERIES ANALYSIS OF BEEF PRICE SPREADS

by

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B. S., Cum Laude, Kansas State University, 1974

A MASTER'S THESIS

Submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1976

Approved by:

Major Professor

1980

ACKNOWLEDGEMENTS

I wish to acknowledge the professional guidance, constructive criticisms and amiable advice of my major professor, Dr. John H. McCoy, who directed this study. A debt of appreciation is also due to Professors Edgar S. Bagley and Frank Orazem for their critical remarks as academic committee members that helped to make this thesis as complete and coherent as possible.

I am indebted to the Kenya Government and the United States Agency for International Development (USAID) for providing funds that enabled me to pursue undergraduate and graduate studies at Kansas State University (KSU). A special appreciation is due to my USAID Program Specialist at the United States Department of Agriculture in Washington, D.C., Dr. Robert W. Doan, and the Director of International Agricultural Programs at KSU, Dr. Vernon C. Larson, for efficiently handling administrative matters related to my program of study.

My gratitude is also extended to Messrs. Ron E. Solomon and John M. Kelly, Research Assistants in the Department of Economics at KSU, for their friendly assistance in computations of data for this thesis. They made my burden lighter and spared me from many sleepless nights.

I would not end this note without expressing my deepest appreciation to my wife, Nabwile, for her flowing stream of letters of encouragement that gave me extra impetus in working through my program of study. My final gratitude is here tendered to my daughter, Nafula, and my son, Waswa, who bore the agony of "dad's" absence for many years while I was away from home

in pursuit of these studies.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF ILLUSTRATIONS

INTRODUCTION

Statement of the Problem

The price spread between the price a consumer pays for a pound of beef at the retail register and the price a beef farmer receives for an equivalent quantity of live animal has been widening over the past two decades, especially with the rising retail beef prices in recent years. Table 1 and Figure 1 indicate that in 1954 the price spread was 32 percent of the consumer's dollar spent on beef, the remaining portion (68 percent) being the farmer's share. By the end of the third quarter in 1975, the price spread had risen to 36 percent of the consumer's beef dollar, with a record high of 40 percent in 1964, and as high as 38 percent in 1961, 1963, 1970 and 1974.

Thus, while the price spread has been widening, the farmer's share of the consumer's beef dollar has been dwindling. This phenomenon has caused considerable continuing concern among beef farmers and consumers.

Farmers have felt that the increasing price spread is reflective of inefficiency in the marketing system, or excessive profits accruing to marketing agencies, or a combination of the two. Most consumers, generally far removed from the agricultural scene, are neither well acquainted with the intricacies of the marketing channel nor with the arduous business of beef cattle production. To many, it is a foregone conclusion that the rising retail beef prices must be putting excessive profits into the pockets of beef farmers and/or the middlemen. The middlemen, on the other hand, have often attacked the validity of beef price spread statistics.

Table 1.--Farm-carcass, carcass-retail, and farm-retail price spreads and farmer's share as percentages of retail value for U.S. choice grade beef, 1954-Sept. 1975

Year	Farm-carcass	Carcass-retail	Farm-retail[a]	Farmer's share
	percent			
1954	11	20	32	68
1955	13	21	34	66
1956	14	22	35	65
1957	12	23	35	65
1958	9	23	33	67
1959	9	24	34	66
1960	9	26	35	65
1961	10	28	38	62
1962	8	24	32	68
1963	9	30	38	62
1964	9	30	40	60
1965	8	28	35	65
1966	7	29	37	63
1967	8	28	36	64
1968	7	27	35	65
1969	7	29	35	65
1970	7	31	38	62
1971	8	27	35	65
1972	7	30	36	64
1973	6	28	34	66
1974	8	30	38	62
1975[b]	9	27	36	64

[a]Due to rounding errors, percentages of farm-carcass and carcass retail price spreads may not add up to the farm-retail percentage.

[b]Only the first 3 quarters of 1975.

Source: Calculated from data in Appendix A.

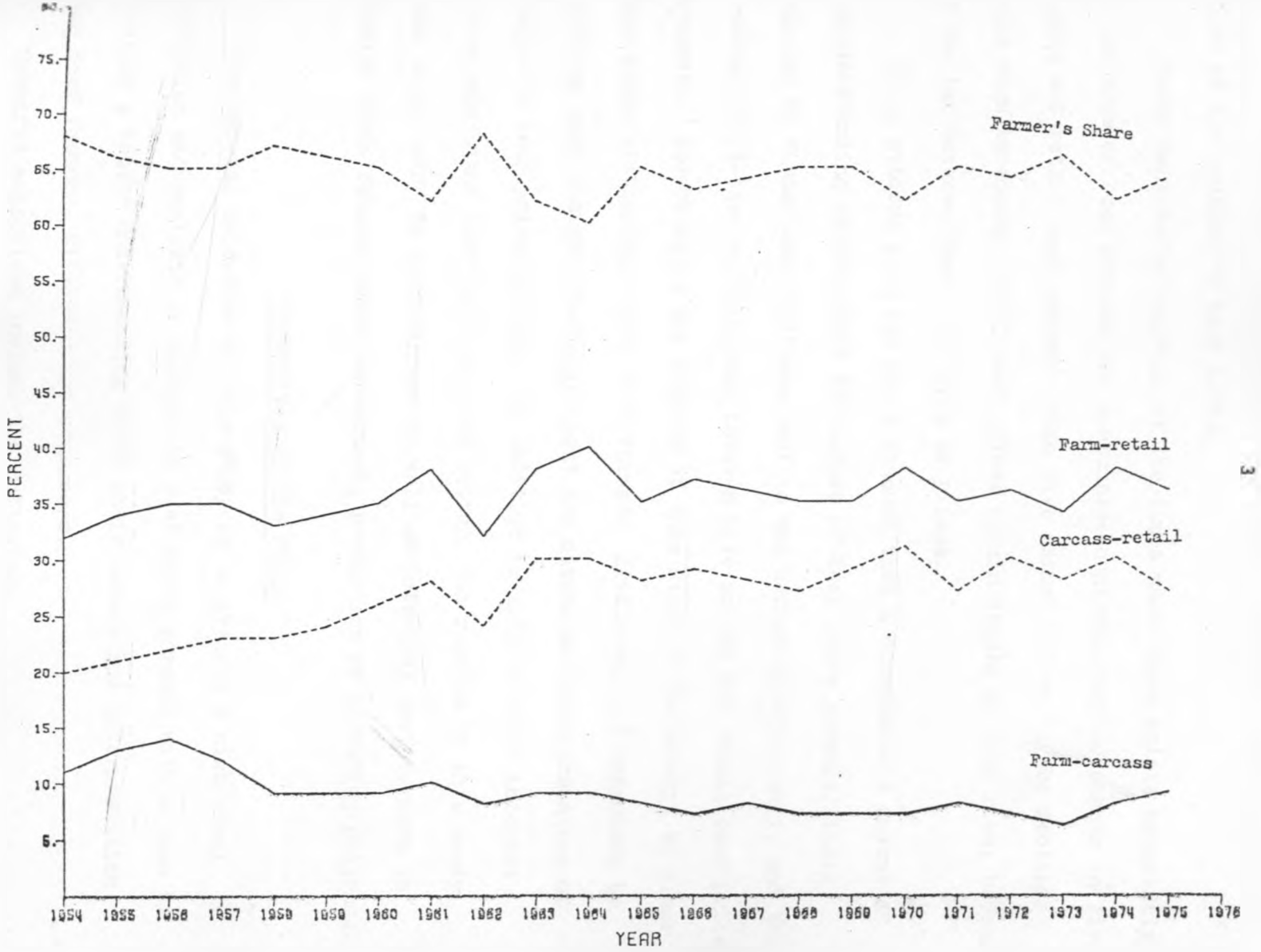

Figure 1. Farm-carcass, carcass-retail, and farm-retail price spreads and farmer's share as percentages of retail value, for choice grade beef, U.S., 1954 - September 1976

They have asserted that beef price spread statistics are not only inaccurate in the way they are computed but also grossly overstate the middlemen's share of the consumer's beef dollar.

These sentiments heighten at the times when there exists apparently--in the eyes of beef farmers and consumers--contradictory movements in live animal and retail beef prices: when live animal prices may be declining while simultaneously retail beef prices remain stable or even rise, because of the lag between these two types of prices.

It is evident from the above account that a considerable amount of misunderstanding exists about the nature of beef price spreads, their relation to farmer and middlemen profits and marketing efficiency, and the lead-lag short-term relationship between live animal and retail beef price movements. Accordingly, the purpose of this study is to attempt to clear these misunderstandings among beef farmers, middlemen, and consumers by providing some insight knowledge about the nature and interpretation of changes in beef price spreads. In addition to helping these interest groups understand beef price spreads better, the results of this study could be of value to beef farmers as well as potential beef farmers in planning their future cattle investment, production or marketing programs.

Objectives of the Study

The general objective of this study is to present a historical description and analysis of changes in beef price spreads with a view to promoting a better understanding about their nature and interpretation among beef farmers, middlemen and consumers.

Specific objectives include the following:

(1) Present a detailed description of concepts and procedures for computing

beef price spreads.

(2) Identify, measure and provide a picture of changes in beef price spreads between January 1954 and September 1975.

(3) From number (2) above, analyze the underlying causes and meaning of the changes in beef price spreads.

(4) Forecast the direction and magnitude of changes in the price spreads through to December 1980.

(5) Determine the lead-lag relationship between live animal and retail beef prices.

CHAPTER 1

REVIEW OF LITERATURE

Origin and Data Base for Price Spreads

The publication of price spread statistics was triggered to an important extent by the concerns of the United States Congress about the effect of proposed agricultural programs on price spreads and retail food prices in the 1930's. "In the early 1930's, it was generally agreed that farm prices were too low, but there was hope that a magical formula might be found to raise prices to farmers with having undesirable effects on prices at other levels, particularly to consumers."[1] In this pursuit, the Congress assigned the United States Department of Agriculture (USDA) the task of collecting data, analyzing and publishing price spread statistics.

Accordingly, in 1935 the USDA issued a preliminary report, "The Margin Between Farm Prices and Retail Prices of Ten Foods," which summarized for the period 1910-34 price spreads for ten farm products. This research was expanded to include 58 items in a 1936 report, "Price Spread Between the Farmer and the Consumer." Beginning with 1941, price spreads for food products have been published on a continuing basis by the USDA in "The Marketing and Transportation Situation" and other reports.[2]

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[1] Kenneth E. Ogren, "Marketing Costs and Margins: New Perspectives in a Changing Economy," Journal of Farm Economics, Vol. 47 No. 5, December 1965, p. 1367.

[2] U.S., Department of Agriculture, Agricultural Marketing Service, Marketing Research Division, Farm-Retail Spreads for Food Products, by Kenneth E. Ogren, Miscellaneous Publication No. 741 (Washington, D.C.: Government Printing Office, November 1957), p. ii.

The USDA measures and publishes price spread statistics for a market basket as well as for the individual food products in the basket. The current market basket contains the average quantities of 65 domestic farm-originated foods purchased annually per household in 1960-61 for preparation at home by families of urban wage earners and clerical workers and workers living alone.[1] Price spread statistics for the market basket and most of the individual food products are composed of four series: (1) retail price; (2) farm value; (3) farm-retail price spread; and (4) the farmer's share of the consumer's food dollar.[2] Beef price spread statistics, with which this study is concerned, contain three additional series: (5) carcass value; (6) farm-carcass price spread; and (7) carcass-retail price spread. Current price spread statistics are published by the USDA in a quarterly issue of "Agricultural Outlook," and in a number of monthly and special reports.

Thus, the data used for this study were obtained from the USDA in various publications and reports. A summary of beef price spread statistical series by month from January 1954 to December 1974 was obtained from Dunham[3] on request.[4]

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[1]U.S., Department of Agriculture, Economic Research Service, Farm Retail Spreads for Food Products, by Marshall E. Miller and Harry H. Harp, Miscellaneous Publication No. 741 (Washington, D.C.: Government Printing Office, January 1972), p. 1.

[2]Ibid., p. 2.

[3]Denis Dunham is an Agricultural Economist in the Sector Performance Measures, Economic Research Service of the U.S. Department of Agriculture, Washington, D.C.

[4]Appendix A.

Definitions, Types and Computation of Beef Price Spreads

Price spread in general is the difference between the monetary value of a quantity of a product at one level of the marketing channel and the value of an equivalent quantity of the product at another level of the marketing channel during a given period of time. There are three types of beef price spreads: (1) farm-carcass price spread; (2) carcass-retail price spread; and (3) farm-retail price spread. Before each of these price spreads is defined, it will help to explain the idea of "equivalent" quantity as used above first.

"The word 'equivalent' is used because 1 pound of retail meat necessitates somewhat more than 1 pound at wholesale and even more at the farm level."[1] For instance, packers purchase a larger quantity of product in form of a live steer than they sell in form of carcass beef to wholesalers. Part of the amount--hence weight--lost from the farm level to the wholesale level is waste and part is salable byproducts. Similarly, retailers buy a larger quantity of carcass beef than they sell in retail cuts to consumers. The loss in amount and weight between wholesale and retail market levels is due to spoilage, shrink, bone and fat trim. It is, therefore, by the computation of "equivalent" quantities that such losses in product quantity and weight can be accounted for in comparing quantities and values at any two levels of the marketing channel.

Two types of "equivalent" quantities and three types of prices are needed in computing beef price spread statistics, namely farm product equivalent, carcass product equivalent, a U.S. average farm price, a U.S. average carcass price and a U.S. average composite retail price.

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[1] John H. McCoy, Livestock and Meat Marketing, (Westport, Connecticut: The AVI Publishing Company, Inc., 1972), p. 394.

Farm product equivalent is the weight of a live animal at the farm gate level[1] that will yield 1 pound of retail cuts sold. Carcass product equivalent is the weight of carcass beef at the wholesale level that will yield 1 pound of retail cuts sold. The USDA has estimated that for choice grade[2] beef, the farm product equivalent is 2.28 pounds, while the carcass product equivalent is 1.41 pounds.[3] The 2.28 pounds at the farm level are equivalent to the 1.41 pounds at the wholesale level, and to 1 pound of retail cuts sold at the retail level.

Product equivalents are converted to value equivalents by multiplying by prices at relevant market levels. Gross farm value equivalent is obtained by multiplying the farm product equivalent by a U.S. average farm price[4] of choice slaughter steers in a given period. In price spread computations, net farm value equivalent is used instead of the gross farm value equivalent. The net farm value equivalent[5] is obtained by subtracting the value of salable byproducts--i.e. hide, etc.--from the gross farm value equivalent. The value of byproducts is excluded from price spread computations because all values used are based on the amount of beef actually

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[1] Farm gate level is the point where a live slaughter animal leaves the area of production for marketing.

[2] Choice grade beef is used for beef price spread statistics because most of the beef sold in the United States is choice grade, according to U.S. Department of Agriculture, Economic Research Service, Developments in Marketing Spreads for Agricultural Products in 1974, Agricultural Economic Report No. 261 (Washington, D.C.: Government Printing Office, April 1975), p. 27.

[3] Miller and Harp, "Farm-Retail Spreads for Food Products," January 1972, pp. 73-74.

[4] Appendix B, p. 104.

[5] Net farm value equivalent will be referred to simply as farm value in subsequent text. When expressed as a percent of retail value, it is termed the farmer's share of the consumer's beef dollar.

sold at the retail level. Carcass value equivalent[1] is obtained by multiplying the carcass product equivalent by a U.S. average wholesale price[2] of choice carcass beef in a given period. Retail value is a U.S. average composite retail price[3] of 1 pound of all cuts sold from a choice carcass.

The three types of beef price spread identified above can now be defined as follows:

The Farm-Carcass Price Spread:

The farm-carcass price spread is the difference between carcass value and farm value. It represents costs incurred and profits obtained by marketing agencies in moving a farm product equivalent from the farm to the wholesale level. In other words, it is the sum of all costs and profits for performing the services of assembling and transporting a live animal, slaughtering, dressing, and shipping the carcass to the point of sale.

The Carcass-Retail Price Spread:

The carcass-retail price spread is the difference between retail value and carcass value. It represents all costs incurred and profits enjoyed by marketing agencies in moving a carcass product equivalent from the wholesale to the hands of the consumer at the retail level. It includes mainly the average gross margin[4] that retailers receive for selling beef, as well as compensation for warehousing and delivery services performed by

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[1]Carcass value equivalent will be referred to simply as carcass value in subsequent text.

[2]Appendix B, p. 102.

[3]Ibid., p. 100.

[4]Gross margin is the difference between what a retailer or packer gets for his product per unit sold and what he pays for it. For more details see pp. 15-16.

retail chains and other carlot buyers, including independent wholesalers who supply retail stores.[1]

The Farm-Retail Price Spread:

The farm-retail price spread is the difference between retail value and farm value. Or, simply, it is the sum of farm-carcass and carcass-retail price spreads. Thus, farm-retail price spread is the sum of all costs incurred and profits obtained by marketing agencies in moving a farm product equivalent from the hands of the farmer at the farm gate level to the hands of the consumer at the retail level. The costs and profits are absorbed in performing the services of assembling, processing, storing, packaging, transporting, wholesaling, and retailing. Each of these services involves costs for labor, energy, capital, business taxes, depreciation of buildings and equipment, etc.[2] In general, the farm-retail price spread is the portion of the consumer's beef dollar that accrues to marketing agencies in the marketing channel, the remaining portion being the farmer's share.

Beef price spreads are computed by the USDA on a weekly and monthly basis, and then aggregated into quarterly and annual price spreads. A computed example of the three types of beef price spreads and the farmer's share for September 1975 is as follows:[3]

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[1] Miller and Harp, "Farm-Retail Spreads for Food Products," January 1972, p. 26.

[2] Table 3, p. 41.

[3] Basic data from U.S. Department of Agriculture, Economic Research Service, Agricultural Outlook, AO-6 (Washington, D.C.: Government Printing Office, November 1975), p. 26.

U.S. average composite retail price (¢/lb)	152.8
U.S. average wholesale price (¢/lb)	81.2
U.S. average farm price (¢/lb)	47.4
Byproduct value (¢ per farm product equivalent)	7.9
Farm product equivalent (lbs)	2.28
Carcass product equivalent (lbs)	1.41
Carcass value equivalent 1.41 x 81.2 (¢/lb retail)	114.5
Carcass-retail price spread 152.8 - 114.5 (¢/lb retail)	38.3
Gross farm value equivalent 2.28 x 47.4 (¢/lb retail)	108.1
Net farm value equivalent 108.1 - 7.9 (¢/lb retail)	100.2
Farm-carcass price spread 114.5 - 100.2 (¢/lb retail)	14.3
Farm-retail price spread 152.8 - 100.2 (¢/lb retail)	52.6

The farmer's share of consumer's beef dollar (percent)

$$\frac{152.8 - 52.6}{152.8} \times 100 = 66$$

Purpose of Price Spreads

[1]"The major purpose of price spread statistics is to measure variations over time in prices--changes in retail prices, farm prices, and prices of (or charges for) services associated with marketing. These data enable changes in retail prices of farm foods to be disaggregated into changes in marketing charges and farm prices. Analyzing price spreads over time provides some insights into the nature and causes of the changes that have occurred.

Over the years these data have contributed to better public enlightenment regarding changes in food prices and their causes. These statistics provide basic intelligence and frequently are the best information available for answering scores of requests from producers, retailers, processors, public agencies, and consumers."

Limitations of Price Spread Statistics

The reliability and adequacy of price spread statistics depend upon the accuracy and appropriateness of the prices and product equivalents from

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[1]U.S., Department of Agriculture, Economic Research Service, Developments in Marketing Spreads for Agricultural Products in 1974, Agricultural Economic Report No. 261 (Washington, D.C.: Government Printing Office, April 1975), p. 26.

...d they are derived. Yet there are two general problems in deriving the ...levant prices and product equivalents at the various levels of the ...cting channel:[1]

"(1) The establishment of comparable physical units as the product ...ergoes changes in form, composition, temperature, processing, shrinkage, ...kaging, etc.

(2) The securing of appropriate prices at different levels of the ...rtical price-structure of the food economy. This may be a problem ...cause of product definition, specification, sampling, or contractual ...lationships over a period of time."

Accordingly retail, wholesale and farm prices collected for use in ...mputing price spreads are subject to sampling, reporting and other statistical errors. Similarly, product equivalents have inherent errors and do not readily reflect changes in physical quantities over considerable periods of time that may range from a year to five or more years. For instance, farm and carcass product equivalents have not been revised or changed since 1962. Product equivalents are deliberately held constant over a period of time so that price spread statistics may measure price changes for relatively comparable beef slaughtering, processing, transportation, retailing and other services. Otherwise, price spreads would show variations that could not necessarily be interpreted as price changes.[2]

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[1] Ray A. Goldberg, "Marketing Costs and Margins: Current use in Agribusiness Market-Structure Analysis," Journal of Farm Economics, Vol. 47 No. 5, December 1965, p. 1352.

[2] U.S., Department of Agriculture, "Developments in Marketing Spreads for Agricultural Products in 1974," April 1975, p. 27.

Miller and Harp[1] contend that price spread statistics are more reliable as indicators of changes in prices and marketing costs than as measures of absolute levels.

Common Misconceptions about Price Spreads and Farmer's Share

It is widely assumed that the farmer's share of the consumer's beef dollar is an accurate indication of the farmer's profit position. That is, that when the farmer's share is declining, his net profit is also declining, and vice versa. This may not necessarily be the case, however. The real economic issue to the farmer should not be so much as to what share of the consumer's beef dollar he gets but rather to what extent he maximizes his farm business objective, be it maximum profits, family welfare, or some other objective or combination of objectives.

The farmer's share is his gross return. Costs must be subtracted from it to know his net profit. The share may be large relative to the farm-retail price spread. But if his costs are high as well, his net profit will be only meager. Besides, the value of byproducts sold must be added to the farmer's share to obtain his total gross return per farm product equivalent. What is more, it would be sound business management for the farmer to be more concerned with the total net profits from the farm business as a whole rather than with profits from individual enterprises, such as beef cattle. Thus, we can not look at the farmer's share of the consumer's beef dollar alone and be able to judge with certainty the farmer's profit position.

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[1] Miller and Harp, "Farm-Retail Spreads for Food Products," January 1972, p. 70.

Another common misconception is the relation between price spread and beef retailer or packer gross margin. Many people use these terms interchangeably without realizing that there are differences between them.

Price spread has been defined above in some detail. It is simply a difference between value equivalents at two market levels for a specific quality of a product. "Gross margin, on the other hand, is often used by industry to mean the difference between what a retailer or packer gets for his product (per unit sold) and what he pays for it."[1] Gross margin thus concerns a single firm between two market levels. It includes costs of labor, packaging and overhead as well as any profit by the firm. Unlike price spread, gross margin does not include the costs and profits of marketing services such as transportation performed on a product by other firms between the two market levels. Hence, a price spread between any two market levels is larger than the gross margin of a single firm between the two market levels.

The USDA lists differences between price spreads and industry gross margins as follows:[2]

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[1] U.S., Department of Agriculture, Economic Research Service, Facts on Farm-Retail Price Spreads for Beef and Pork, ERS 597 (Washington, D.C.: Government Printing Office, February 1975), p. 28.

[2] Ibid., p. 29.

USDA Price Spreads	Gross Margins
1. Represent U.S. average.	1. Usually represent a single firm.
2. Choice grade beef only.	2. Includes other grades as well as choice.
3. Concurrent prices or values at each market level.	3. Time lagged prices between purchase and sale.
4. Cut prices weighted by carcass proportions.	4. Mix of cuts sold may vary from carcass proportion.
5. Retail pound equivalent basis.	5. May be stated on live weight or carcass weight basis.
6. Includes charges between pricing points.	6. Includes only charges for retailing or meat packing.
7. Carcass beef prices.	7. Primal, subprimal, and cut prices, as well as carcass beef.
8. Standardized yields.	8. Cutting test yields.
9. Based on (Bureau of Labor Statistics) BLS prices, adjusted for price and quantity effects of specialing, using price data reported to (Economic Research Service) ERS by a sample of retail food chain divisions.	9. Sales volume weighted average of special and regular retail prices.

Another common misconception about price spread (farm-retail price spread) is its implications with recpect to marketing efficiency. As was stated in the statement of the problem above, farmers have regarded the widening of farm-retail beef price spread over the years partly as indicative of inefficiency in the marketing system. "Neither the farmer's share, nor the absolute amount of marketing (price) spread is adequate in itself for evaluating marketing efficiency--either operational efficiency or pricing efficiency."[1] For instance, the farm-retail price spread as a percent of the consumer's dollar spent for lettuce in April 1975 was 66 percent, whereas it was 33 percent for choice beef during the same month.[2] On the basis of

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[1]John H. McCoy, Livestock and Meat Marketing, (Westport, Connecticut: The AVI Publishing Company, Inc., 1972), p. 404.

[2]U.S., Department of Agriculture, Economic Research Service, Agricultural Outlook, AO-6 (Washington, D.C.: Government Printing Office, November 1975), p. 26.

these figures, some people would conclude that the marketing of lettuce is less efficient than that of choice beef. This would be an unwarranted conclusion. Some products simply require more marketing services relative to their value than do others. This is the above case with choice beef versus lettuce, where processing costs for instance are substantially higher for lettuce relative to its value than for the beef.

"It would be possible to reduce farm-retail price spread to zero (e.g. farmers could get 100 percent of the consumer's beef dollar if they slaughtered, processed, and delivered meat to the consumers' doors). This, however, is not necessarily the most efficient system. In fact, it was discovered long ago that specialization and trade, based on comparative advantage would result in a greater total and per capita real income."[1]

Price Spreads Versus Level of Economic Development

It has been pointed out above that price spreads represent costs and profits of services added to food products between the farmer and the consumer. Accordingly, they are apt to be higher relative to retail prices in a more developed economy, where more marketing services are added than in a less developed economy where the producer is often the middleman as well. This view is supported by Darrah when he states:

> [2]"Marketing costs that are high relative to retail prices are common in such countries as the United States, with its high degree of industrialization and urbanization. Marketing costs that are low relative to retail prices are typical of areas whose economy is largely agricultural. Thus, marketing costs, in a general way, may be considered a reflection of a country's economy and stage of development and should not be condemned unless one blindly favors a complete return to a less progressive society.

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[1]John H. McCoy, "Livestock and Meat Marketing," p. 404.

[2]L. B. Darrah, Food Marketing, (New York: The Ronald Press Company, 1971), p. 318.

However, as people's education, incomes and standards of living have risen, as more and more women have abandoned the idea of spending a life time in the kitchen for an industry or some other "man's" job, and as urban populations have continued to expand in these predominantly agrarian societies, smaller and smaller proportions of income are expended for raw food products, and greater and greater proportions of the income are used to call forth additional and improved marketing services. Indeed, as Darrah puts it, "Instead of buying wheat or flour with which to make bread, people buy bread enriched with minerals and vitamins that is already baked, sliced, wrapped, and delivered fresh daily."[1]

As a result of these developments, today in many less developed countries, as much as in more developed ones, food producers and consumers alike are complaining that farm-retail price spreads have and are growing too wide.[2] But, producers and consumers in the less developed countries are less fortunate than their counterparts in the more developed countries. Price spread information available in more developed countries like the United States is non-existant in most, if not all, less developed countries. There, much more than in the United States, for example, food producers, consumers and private as well as governmental agricultural policy makers lack the knowledge and understanding of the nature and causes of changes in the widening food price spreads.

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[1] L. B. Darrah, "Food Marketing," p. 318.

[2] However, it must be categorically stated here that the number and degree of sophistication of services added to food products domestically produced and marketed are higher in the more developed than in the less developed countries.

CHAPTER II

RESEARCH METHODOLOGY

Time Series Approach

"A time series may be defined as a sequence of repeated measurements of a variable made periodically through time."[1] Thus, beef price spreads and values[2] are time series. Such time series are assumed to contain four basic components: secular trend, seasonal variations, cyclical fluctuations, and irregular movements.[3]

In order to gain a better understanding and picture of the nature and causes of changes in beef price spreads (and values), it is necessary to isolate and analyze the four components of the time series separately. Such a decomposition of time series into their parts requires an assumption about the relationship existing among the various components. Before discussing the methods that were employed in decomposing the beef price spread and value time series, some definition of the time series components will be given as follows:

Secular trend:

"A secular, or long-term, trend refers to the smooth and regular

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[1]Cecil H. Meyers, Elementary Business and Economic Statistics, Belmont, California: The Wadsworth Publishing Company, Inc., 1970), p. 446.

[2]Beef price spreads are farm-carcass, carcass-retail, and farm-retail; beef values are farm value, carcass value, and retail value. All these terms have been discussed in Chapter 1 of this study.

[3]Lincoln L. Chao, Statistics: Methods and Analyses, (New York: McGraw-Hill Book Company, Inc., 1969), p. 557.

movements of a series reflecting continuous growth, stagnation, or decline over a rather long period of time....What the trend measures is the average change in the variable per unit of time. It characterizes the gradual and general pattern of developments, which is often described by a straight line or some type of smooth curve."[1]

Seasonal variations:

Seasonal variations are periodic variations that recur with some degree of regularity within a specific period of 1 year or shorter.[2] The underlying factor responsible for seasonal variations in beef price spreads is climatic conditions.

Cyclical fluctuations:

Cyclical fluctuations are characterized by recurring up-and-down movements, which are different from seasonal variations in that they extend over longer periods of time--usually 2 or more years, but they are shorter than secular trends.[3]

Irregular movements:

"Irregular movements of time series are either random or caused by some sporadic forces such as war, earthquake, flood, droughts, and other natural catastrophes. Such fluctuations are nonrecurring and, therefore, completely unpredictable."[4] However, these unpredictable events can be easily recognized and identified, and thus can be easily eliminated from

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[1] Ibid., p. 358.

[2] Ibid.

[3] Ibid., pp. 359-360.

[4] Ibid., p. 360.

the data in measuring the other components of a time series. Irregular variations are often comparatively unimportant and are usually considered a part of the seasonal or cyclical variations or simply ignored. However, they were also isolated and analyzed in this study.

Time Series Models

"Two time series models are generally accepted as good 'approximations' to the true relationship among the components of a time series data. They are the 'additive' and the 'multiplicative' models, and are the most commonly assumed relationship between a time series and its elements."[1]

Let

i = position of a month from 1 to n, where n = 261, the total number of months in the data used.

Y_i = original measured value of a time series variable for the i th month.[2]

T_i = corresponding value of the secular trend component.

S_i = corresponding value of the seasonal component.

C_i = corresponding value of the cyclical component.

I_i = corresponding value of the irregular component.

The additive model assumes that the original measured value of the composite series is the sum of the four components.[3] That is,

$$Y_i = T_i + S_i + C_i + I_i$$

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[1] Ibid., p. 361.

[2] The original values of the time series--farm, carcass, and retail values, farm-carcass, carcass-retail, and farm-retail price spreads are given in Appendix A.

[3] Lincoln L. Chao, "Statistics: Methods and Analyses," p. 361.

All the four components here are viewed as absolute values. On the other hand, the multiplicative model assumes that the value of the composite series is the product of the four components.[1] That is,

$$Y_i = T_i \times S_i \times C_i \times I_i$$

According to this model, only the trend component is viewed as an absolute value; the other three components are expressed as percentages. S_i is a percent of T_i; C_i is a percent of the $T_i \times S_i$ product; and I_i is a percent of the $T_i \times S_i \times C_i$ product.

"Generally, the multiplicative model has been considered the standard conventional model for analysis of time series."[2] For this reason, the multiplicative model was used for the decomposition of the beef price spread and value time series.

Before discussing the decomposition procedures, it may be worthwhile first to point out some inherent limitations[3] of the method. The four components are interdependent. An extremely unusual seasonal variation for instance, may precipitate or at least aggravate, the cyclical development; conversely, a cyclical fluctuation may greatly influence the seasonal variation. Likewise, a severe cyclical fluctuation may strongly affect the secular trend, and irregular movements may substantially alter any or all of the other components. Thus, the decomposition of the time series into separate components is by no means a complete accurate account of the relationship among them.

Isolating the Secular Trends

Each price spread and value series was initially plotted on a graph

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[1] Ibid.

[2] Ibid.

[3] Ibid., pp. 362-363.

paper to determine which type of trend model--straight line or curve--would best fit the data. Visual inspection of the plotted lines indicated that in each case, the average change in cents per retail pound was not constant but varied from period to period. For this phenomenon, a trend model with a curve would fit the data better. Accordingly, a Least-Squares second degree parabolic trend model[1] was used to derive the trend in each case.[2] The formula used was:

$$T_i = a + bx_i + cx_i^2$$

where

i = as defined above

T_i = computed value of the secular trend component in current cents for a time series in the i th month.

x_i = time-centered position of the i th month counted from the median month of the time series. The median month used was November 1964. Positions of months before November 1964 carried negative signs. The x_i position for November 1964 was 0. Positions of months thereafter carried positive signs.

$$a = \frac{\sum_{i=1}^{n} Y_i - c \sum_{i=1}^{n} x_i^2}{n}$$

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[1] Ibid., pp. 368-370.

[2] All computations in the exercise of decomposing the time series and the drawing of graphs in the subsequent text were performed by computer, with programming help from staff in the Department of Economics, Kansas State University.

$$b = \frac{\sum_{i=1}^{n} x_i Y_i}{\sum_{i=1}^{n} x_i^2}$$

$$c = \frac{n \sum_{i=1}^{n} x_i^2 Y_i - \sum_{i=1}^{n} x_i^2 \sum_{i=1}^{n} Y_i}{n \sum_{i=1}^{n} x_i^4 - \left(\sum_{i=1}^{n} x_i^2 \right)^2}$$

and where

$\sum_{i=1}^{n}$ = sum of values from number 1 to n, where n has been indicated above as 261.

Y_i = As defined above.

a is the Y intercept, while b and c are related to the slope and the rate of change of the curve respectively. The T_i and Y_i values were charted on same graph. The results obtained and analysis thereof are given in Chapter III.

Isolating the Seasonal Variations

In order to isolate the seasonal component, seasonal indices were calculated. Seasonal indices are percentage measures of seasonal variations in the behavior of any variable.[1] The Ratio-to-Moving-Average Method as discussed by Meyers[2] was employed to derive the seasonal indices for each

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[1] Ibid., p. 371.

[2] Cecil H. Meyers, "Elementary Business and Economic Statistics," pp. 497-502.

time series. This method was chosen for reasons stated by Shiskin:[1]

(1) It has been thoroughly tested in the past and has proved satisfactory for a large variety of economic series.

(2) It permits checking and analysis at each of the many stages in the seasonal adjustment process.

(3) It has been almost universally accepted by economists and business analysts, who are the chief users of seasonally adjusted data.

The steps[2] followed in computing seasonal indices for each time series were as follows:

(1) A 13-month centered moving average was calculated for the data. Construction of the moving average inherently caused a loss of 6 months of data at each end of the time series.

(2) The corresponding original Y_i value was divided by the moving average to obtain a ratio. This, then, is the ratio of the original Y_i value to the typical value for that month as represented by the moving average--hence the name of the method. Subsequently, the ratio was multiplied by 100 for representation in the usual seasonal indices form.

(3) These indices were then arranged in tabular form by month and year.

(4) The indices were then arrayed by month--that is, ranked from low to high--and the median value was selected as the "typical" seasonal value for that particular month.

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[1] U.S., Department of Agriculture, Agricultural Marketing Service, Marketing Economics Research Division, Seasonal Variation in Farm, Food Prices and Price Spreads, Miscellaneous Publication No. 840 (Washington, D.C.: Government Printing Office, January 1961), p. 46.

[2] Based upon Cecil H. Meyers, "Elementary Business and Economic Statistics," pp. 497-501.

(5) The final step in constructing the seasonal indices was to determine whether the sum of 12 indices was 1,200.0. Theoretically, the 12 seasonal indices should average to 100 (sum to 1200). However, because the median value (an average of position) was used rather than the mean (an average of calculation), in each case, the 12 indices did not total exactly 1,200. Accordingly, an adjustment to the typical median values obtained in step 4 above was necessary in order to bring the sum of 12 indices in each case to exactly 1,200. To accomplish this, the 12 typical (unadjusted) median values were summed up. Then 1,200 was divided by the sum, to obtain the adjustment factor. Each unadjusted median for a month was then multiplied by this adjustment factor, to obtain the seasonal index (S_i) for that month. The seasonal indices for each time series were then graphed by month.

The results obtained and analysis thereof are presented in Chapter IV.

Isolating the Cyclical Fluctuations[1]

In the multiplicative time series model $Y_i = T_i \times S_i \times C_i \times I_i$, the T_i and S_i values were obtained as has been described above. The first step in isolating the cyclical component was, therefore, to eliminate the $T_i \times S_i$ product from the original Y_i series, leaving the $C_i \times I_i$ combination. This was achieved by the following division:

$$\frac{T_i \times S_i \times C_i \times I_i}{T_i \times S_i} = C_i \times I_i$$

where all terms have been defined above. The second step was to get rid of the irregular component I_i from the combination $C_i \times I_i$ leaving the cyclical

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[1] Based upon Lincoln L. Chao, "Statistics: Methods and Analyses," p. 376.

component C_i. This was accomplished by a 9-month moving average method, whereby the irregular component was canceled out in the process of averaging. Thus, the 9-month moving averages were recorded as the cyclical percentages for the cyclical component. These were graphed by month and year, and the results and analysis are presented in Chapter V.

Isolating the Irregular Movements[1]

The irregular component was isolated by dividing the cyclical percentages obtained in the foregoing section into the $C_i \times I_i$ combination as follows:

$$I_i = \frac{C_i \times I_i}{C_i}$$

where all terms are as defined above. The I_i values so obtained were the irregular component percentages. Results and analysis are presented in Chapter VI.

Lead-Lag Relationship Between Live Animal and Retail Beef Prices

As was stated in the problem statement, beef farmers and consumers often get uneasy when short-term price changes at the farm level (especially declining farm prices) are not immediately followed by similar changes in beef prices at the retail level. A knowledge of lead-lag relationship between live animal and retail beef prices is required to comprehend this problem.

Farm and carcass price (hence value) changes usually occur during the same week.[2] However, a period of time elapses before retail prices respond

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[1] Ibid.

[2] U.S., Department of Agriculture, Economic Research Service, Facts on Farm-Retail Price Spreads for Beef and Pork, ERS 597 (Washington, D.C.: Government Printing Office, February 1975), p. 30.

to the price changes at the farm and wholesale levels. Part of this lag in retail price may be explained by the fact that time elapses between the time when a farmer sells an animal and the eventual sale of meat from the animal to the consumer. However, the physical time required to move meat through the marketing system may differ from the time normally required for a change in prices at one market level to be reflected at another.

One objective of this study was to determine an average length of the lag between changes in live animal and beef retail prices for periods of advancing and declining live animal prices since January 1954, and to test a common hypothesis that beef retailers respond more readily to increasing than declining live animal prices. In lag terminology, this hypothesis is tantamount to saying that the lag between changes in live animal and retail prices is less for rising than for falling live animal prices. Or, in other words, beef retailers react quickly by raising their prices when cattle prices are rising but hesitate to lower their prices when cattle prices start falling.

In order to achieve the results desired, a definition of a period of increasing or decreasing live animal (cattle) prices was required. Since such a standard definition was not found in the literature reviewed, an arbitrary definition was made up as follows: A period of increasing or decreasing live animal prices is one in which the general continuous trend in live animal prices in the relevant direction is at least 4 months. Data used were the monthly retail value time series and monthly average Omaha Choice 900-1100 pound slaughter steer prices, from January 1954 to December 1974, obtained in previously cited USDA references.

Using the above definition and data, the following steps were followed:

(1) Both live steer prices and retail values were charted on the same graph by month and year.

(2) Periods of increasing and decreasing live animal prices were marked off on the steer price line.

(3) For each period the following information was observed and recorded in a table:

(i) Beginning and ending months and prices, and duration of the period, for the steer prices.

(ii) Beginning and ending lag and prices, and duration of the period, for the retail prices.

(4) Average duration, average beginning and ending prices, and average percentage change in price for steer prices during total periods of increasing prices, and also of decreasing prices, were calculated.

(5) Average duration, average beginning and ending lag and price, and average percentage change in price, for retail values during total periods of increasing prices, as well as of decreasing prices, were calculated.

The results and discussion thereof are presented in Chapter VII.

CHAPTER III

SECULAR TRENDS IN BEEF PRICE SPREADS WITH PROJECTIONS TO 1980

Results of isolating the secular trend component from beef price spread and beef value time series are summarized in Table 2 and Figures 2 and 3 below. The major purpose of isolating the secular trend component in each series was to determine the average change in the variable per unit of time, and also give the direction and picture of change in the variable over the entire period being studied i.e. from January 1954 to end of September 1975, so that an analysis of factors affecting the secular trends could be made.

Parametric estimates of the Least-Squares second degree parabolic trend model fitted to the original data in each series are given under appropriate price spread and beef value sections below. These estimates describe the average changes in price spreads and values in cents per retail pound[1] per month. Table 2 gives the computed trend values per month for each variable, and Figures 2 and 3 provide the direction and picture change in each variable over the entire period. It must be pointed out that in reference to Table 2, the farm-carcass and carcass-retail price spread trend values do not necessarily add up to the corresponding farm-retail price spread trend values. The explanation is that the farm-retail price spread trend values were not derived from the two price spreads but from

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[1] Retail pound is a pound of representative cuts from a carcass; see Table 14 in Appendix B.

TABLE 2 --- Computed monthly moving trend values for farm, carcass, and retail values, and farm-carcass, carcass-retail, and farm-retail price spreads for choice grade beef, U.S., January 1954 - December 1975.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass[a]	Carcass-Retail[a]	Farm-Retail[a]
		---------- cents ----------					
1954	January	49.72	60.70	75.82	9.24	15.10	24.43
	February	49.61	60.50	75.64	9.19	15.12	24.40
	March	49.50	60.30	75.45	9.14	15.15	24.37
	April	49.39	60.10	75.23	9.10	15.15	24.34
	May	49.28	59.90	75.10	9.05	15.17	24.32
	June	49.18	59.71	74.83	9.00	15.19	24.29
	July	49.08	59.52	74.75	8.96	15.21	24.26
	August	48.98	59.34	74.60	8.91	15.24	24.24
	September	48.88	59.15	74.44	8.87	15.26	24.22
	October	48.78	58.97	74.28	8.82	15.28	24.19
	November	48.69	58.80	74.12	8.78	15.30	24.17
	December	48.60	58.62	73.97	8.74	15.33	24.15
1955	January	48.51	58.45	73.83	8.69	15.35	24.13
	February	48.42	58.28	73.68	8.65	15.38	24.11
	March	48.33	58.11	73.54	8.61	15.40	24.10
	April	48.25	57.95	73.40	8.57	15.43	24.08
	May	48.17	57.79	73.27	8.52	15.46	24.06
	June	48.09	57.63	73.14	8.48	15.49	24.05
	July	48.01	57.47	73.01	8.44	15.51	24.04
	August	47.93	57.32	72.69	8.40	15.54	24.02
	September	47.86	57.17	72.77	8.36	15.57	24.01
	October	47.79	57.03	72.65	8.32	15.60	24.00
	November	47.71	56.88	72.54	8.28	15.63	23.99
	December	47.65	56.74	72.43	8.24	15.66	23.98
1956	January	47.58	56.60	72.32	8.20	15.70	23.98
	February	47.52	56.47	72.22	8.17	15.73	23.97
	March	47.45	56.33	72.12	8.13	15.76	23.97
	April	47.39	56.20	72.02	8.09	15.79	23.96
	May	47.34	56.07	71.93	8.05	15.83	23.96
	June	47.28	55.95	71.84	8.02	15.86	23.96
	July	47.23	55.83	71.75	7.98	15.90	23.95
	August	47.17	55.71	71.67	7.95	15.94	23.95
	September	47.12	55.59	71.59	7.91	15.97	23.95
	October	47.08	55.48	71.52	7.88	16.01	23.96
	November	47.03	55.37	71.44	7.84	16.05	23.95
	December	46.99	55.26	71.37	7.81	16.09	23.96
1957	January	46.94	55.16	71.31	7.77	16.12	23.97
	February	46.90	55.05	71.25	7.74	16.16	23.97
	March	46.87	54.96	71.19	7.71	16.20	23.98
	April	46.83	54.86	71.13	7.68	16.24	23.99
	May	46.80	54.76	71.08	7.64	16.29	23.99
	June	46.76	54.67	71.03	7.61	16.33	24.00
	July	46.73	54.59	70.98	7.58	16.37	24.01
	August	46.70	54.50	70.94	7.55	16.41	24.03
	September	46.68	54.42	70.90	7.52	16.46	24.04
	October	46.65	54.34	70.87	7.49	16.50	24.05
	November	46.63	54.26	70.84	7.46	16.55	24.07
	December	46.61	54.19	70.81	7.43	16.59	24.08
1958	January	46.59	54.12	70.78	7.40	16.64	24.10
	February	46.58	54.05	70.76	7.37	16.69	24.12
	March	46.56	53.98	70.74	7.34	16.73	24.13
	April	46.55	53.92	70.73	7.32	16.78	24.15
	May	46.54	53.86	70.72	7.29	16.83	24.17
	June	46.53	53.80	70.72	7.26	16.88	24.20
	July	46.53	53.75	70.72	7.24	16.93	24.22
	August	46.52	53.69	70.72	7.21	16.98	24.24
	September	46.52	53.65	70.71	7.18	17.03	24.27
	October	46.52	53.60	70.72	7.16	17.08	24.29
	November	46.52	53.56	70.72	7.13	17.13	24.32
	December	46.53	53.52	70.73	7.11	17.19	24.35
1959	January	46.53	53.48	70.75	7.09	17.24	24.38
	February	46.54	53.44	70.77	7.06	17.30	24.40
	March	46.55	53.41	70.79	7.04	17.35	24.44
	April	46.56	53.38	70.82	7.02	17.40	24.47
	May	46.58	53.35	70.85	6.99	17.46	24.50
	June	46.59	53.33	70.88	6.97	17.52	24.53
	July	46.61	53.31	70.9	6.95	17.57	24.57
	August	46.63	53.29	70.95	6.93	17.63	24.60
	September	46.65	53.28	71.00	6.91	17.69	24.64
	October	46.68	53.26	71.04	6.89	17.75	24.68
	November	46.70	53.25	71.09	6.87	17.81	24.72
	December	46.73	53.25	71.15	6.86	17.87	24.76

TABLE 2.— Continued.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass[a]	Carcass-Retail[a]	Farm-Retail[a]
		cents					
1960	January	46.76	53.24	71.20	6.48	17.96	24.50
	February	46.77	53.24	71.38	6.47	17.99	24.54
	March	46.83	53.24	71.33	6.41	18.09	24.50
	April	46.86	53.25	71.39	6.39	18.14	24.53
	May	46.90	53.25	71.46	6.35	18.21	24.56
	June	46.94	53.26	71.54	6.32	18.28	24.60
	July	46.98	53.28	71.61	6.30	18.33	24.63
	August	47.03	53.29	71.69	6.26	18.40	24.66
	September	47.07	53.31	71.78	6.24	18.47	24.71
	October	47.12	53.33	71.86	6.21	18.53	24.74
	November	47.17	53.36	71.95	6.19	18.59	24.78
	December	47.22	53.38	72.05	6.16	18.67	24.83
1961	January	47.27	53.41	72.15	6.14	18.74	24.88
	February	47.33	53.44	72.25	6.11	18.81	24.92
	March	47.39	53.48	72.35	6.09	18.87	24.96
	April	47.45	53.52	72.46	6.07	18.94	25.01
	May	47.51	53.56	72.57	6.05	19.01	25.06
	June	47.57	53.60	72.68	6.03	19.08	25.11
	July	47.64	53.65	72.80	6.01	19.15	25.16
	August	47.71	53.70	72.92	5.99	19.22	25.21
	September	47.78	53.75	73.05	5.97	19.30	25.27
	October	47.85	53.80	73.18	5.95	19.38	25.33
	November	47.92	53.86	73.31	5.94	19.45	25.39
	December	48.00	53.92	73.44	5.92	19.52	25.44
1962	January	48.08	53.98	73.58	5.90	19.60	25.50
	February	48.16	54.05	73.72	5.89	19.67	25.56
	March	48.24	54.12	73.87	5.88	19.75	25.63
	April	48.32	54.19	74.02	5.87	19.83	25.70
	May	48.41	54.26	74.17	5.85	19.91	25.76
	June	48.50	54.34	74.32	5.84	19.98	25.82
	July	48.59	54.42	74.48	5.83	20.06	25.89
	August	48.68	54.50	74.64	5.82	20.14	25.96
	September	48.77	54.59	74.81	5.82	20.22	26.04
	October	48.87	54.68	74.98	5.81	20.30	26.12
	November	48.97	54.77	75.15	5.80	20.38	26.17
	December	49.07	54.86	75.32	5.79	20.46	26.25
1963	January	49.17	54.96	75.50	5.79	20.54	26.33
	February	49.27	55.06	75.69	5.79	20.63	26.42
	March	49.38	55.16	75.87	5.78	20.71	26.49
	April	49.49	55.26	76.06	5.77	20.80	26.57
	May	49.60	55.37	76.25	5.77	20.88	26.65
	June	49.71	55.48	76.45	5.77	20.97	26.74
	July	49.82	55.60	76.65	5.78	21.05	26.83
	August	49.94	55.71	76.85	5.77	21.14	26.91
	September	50.06	55.83	77.06	5.77	21.23	27.00
	October	50.18	55.95	77.27	5.77	21.32	27.09
	November	50.30	56.08	77.48	5.78	21.40	27.18
	December	50.42	56.21	77.70	5.79	21.49	27.28
1964	January	50.55	56.34	77.92	5.79	21.58	27.37
	February	50.68	56.47	78.14	5.79	21.67	27.46
	March	50.80	56.61	78.37	5.81	21.76	27.57
	April	50.94	56.74	78.60	5.80	21.86	27.66
	May	51.07	56.89	78.83	5.82	21.94	27.76
	June	51.21	57.03	79.07	5.82	22.04	27.86
	July	51.34	57. 8	79.31	5.83	22.13	27.97
	August	51.48	57.33	79.56	5.85	22.23	28.08
	September	51.63	57.48	79.80	5.85	22.32	28.17
	October	51.77	57.63	80.05	5.86	22.42	28.28
	November	51.92	57.79	80.30	5.87	22.51	28.38
	December	52.06	57.95	80.56	5.89	22.61	28.50
1965	January	52.21	58.12	80.82	5.91	22.70	28.61
	February	52.37	58.28	81.08	5.91	22.80	28.71
	March	52.52	58.45	81.35	5.93	22.90	28.83
	April	52.68	58.63	81.62	5.95	22.99	28.94
	May	52.85	58.80	81.90	5.95	23.10	29.05
	June	53.03	58.98	82.17	5.95	23.19	29.14
	July	53.19	59.15	82.45	5.96	23.30	29.26
	August	53.38	59.34	82.74	5.96	23.40	29.36
	September	53.49	59.52	83.03	6.03	23.51	29.54
	October	53.65	59.72	83.32	6.07	23.60	29.67
	November	53.85	59.91	83.61	6.06	23.70	29.76
	December	53.99	60.10	83.91	6.11	23.81	29.92

TABLE I.--- Continued.

Year	Month	Farm Value	Charges Value	Retail Value	Farm-Charges[1]	[illegible]	[illegible]
		----------	----------	----------	Cents ----------	----------	----------
1966	January	54.17	60.30	84.21	6.49	[illegible]	[illegible]
	February	54.34	60.50	84.52	6.50	[illegible]	[illegible]
	March	54.52	60.71	84.82	6.51	[illegible]	[illegible]
	April	54.70	60.91	85.14	6.53	[illegible]	[illegible]
	May	54.88	61.12	85.45	6.53	[illegible]	[illegible]
	June	55.07	61.33	85.77	6.54	[illegible]	[illegible]
	July	55.25	61.55	86.09	6.56	[illegible]	[illegible]
	August	55.44	61.76	86.42	6.57	[illegible]	[illegible]
	September	55.63	61.98	86.74	6.59	[illegible]	[illegible]
	October	55.82	62.20	87.08	6.59	[illegible]	[illegible]
	November	56.02	62.43	87.41	6.61	[illegible]	[illegible]
	December	56.21	62.66	87.75	6.62	[illegible]	[illegible]
1967	January	56.41	62.89	88.09	6.64	[illegible]	[illegible]
	February	56.61	63.12	88.44	6.65	[illegible]	[illegible]
	March	56.81	63.36	88.79	6.67	[illegible]	[illegible]
	April	57.02	63.60	89.14	6.68	[illegible]	[illegible]
	May	57.22	63.84	89.50	6.70	[illegible]	[illegible]
	June	57.43	64.09	89.85	6.71	[illegible]	[illegible]
	July	57.64	64.33	90.22	6.73	[illegible]	[illegible]
	August	57.85	64.59	90.58	6.75	[illegible]	[illegible]
	September	58.07	64.84	90.95	6.77	[illegible]	[illegible]
	October	58.28	65.09	91.32	6.78	[illegible]	[illegible]
	November	58.50	65.35	91.70	6.80	[illegible]	[illegible]
	December	58.72	65.62	92.08	6.82	[illegible]	[illegible]
1968	January	58.94	65.88	92.46	6.84	[illegible]	[illegible]
	February	59.17	66.15	92.85	6.86	[illegible]	[illegible]
	March	59.39	66.42	93.24	6.88	[illegible]	[illegible]
	April	59.62	66.69	93.63	6.90	[illegible]	[illegible]
	May	59.85	66.97	94.03	6.92	[illegible]	[illegible]
	June	60.08	67.25	94.43	6.94	[illegible]	[illegible]
	July	60.32	67.53	94.83	6.96	[illegible]	[illegible]
	August	60.55	67.81	95.24	6.98	[illegible]	[illegible]
	September	60.79	68.10	95.65	7.01	[illegible]	[illegible]
	October	61.03	68.39	96.06	7.03	[illegible]	[illegible]
	November	61.27	68.68	96.48	7.05	[illegible]	[illegible]
	December	61.52	68.98	96.90	7.08	[illegible]	[illegible]
1969	January	61.76	69.27	97.32	7.10	[illegible]	[illegible]
	February	62.01	69.58	97.75	7.12	[illegible]	[illegible]
	March	62.26	69.88	98.18	7.15	[illegible]	[illegible]
	April	62.51	70.19	98.62	7.17	[illegible]	[illegible]
	May	62.76	70.50	99.05	7.20	[illegible]	[illegible]
	June	63.02	70.81	99.49	7.23	[illegible]	[illegible]
	July	63.28	71.12	99.94	7.25	[illegible]	[illegible]
	August	63.54	71.44	100.39	7.28	[illegible]	[illegible]
	September	63.80	71.76	100.84	7.31	[illegible]	[illegible]
	October	64.06	72.08	101.29	7.33	[illegible]	[illegible]
	November	64.33	72.41	101.75	7.36	[illegible]	[illegible]
	December	64.60	72.74	102.21	7.39	[illegible]	[illegible]
1970	January	64.87	73.07	102.67	7.42	[illegible]	[illegible]
	February	65.14	73.41	103.14	7.45	[illegible]	[illegible]
	March	65.41	73.74	103.61	7.48	[illegible]	[illegible]
	April	65.69	74.08	104.09	7.51	[illegible]	[illegible]
	May	65.97	74.43	104.57	7.54	[illegible]	[illegible]
	June	66.25	74.77	105.05	7.57	[illegible]	[illegible]
	July	66.53	75.12	105.53	7.60	[illegible]	[illegible]
	August	66.81	75.47	106.02	7.63	[illegible]	[illegible]
	September	67.10	75.83	106.51	7.66	[illegible]	[illegible]
	October	67.39	76.18	107.01	7.70	[illegible]	[illegible]
	November	67.68	76.54	107.51	7.73	[illegible]	[illegible]
	December	67.97	76.91	108.01	7.76	[illegible]	[illegible]
1971	January	68.26	77.27	108.52	7.79	[illegible]	[illegible]
	February	68.56	77.64	109.02	7.83	[illegible]	[illegible]
	March	68.86	78.01	109.54	7.86	[illegible]	[illegible]
	April	69.16	78.39	110.05	7.90	[illegible]	[illegible]
	May	69.46	78.76	110.57	7.93	[illegible]	[illegible]
	June	69.76	79.14	111.09	7.97	[illegible]	[illegible]
	July	70.07	79.52	111.62	8.00	[illegible]	[illegible]
	August	70.38	79.91	112.15	8.04	[illegible]	[illegible]
	September	70.69	80.29	112.69	8.08	[illegible]	[illegible]
	October	71.00	80.69	113.22	8.11	[illegible]	[illegible]
	November	71.31	81.08	113.76	8.15	[illegible]	[illegible]
	December	71.63	81.48	114.30	8.19	[illegible]	[illegible]

TABLE 4.-- Continued.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-carcass[a]	Farm-retail[a]	Carcass-retail[a]
				cents			
1972	January	71.95	81.68	114.84	9.73	[illegible]	[illegible]
	February	72.27	[illegible]	115.59	9.87	[illegible]	[illegible]
	March	72.59	82.68	115.95	9.91	[illegible]	[illegible]
	April	72.91	83.09	116.50	9.35	[illegible]	[illegible]
	May	73.24	83.60	117.06	9.59	[illegible]	[illegible]
	June	73.57	83.91	117.63	9.43	[illegible]	[illegible]
	July	73.89	84.33	118.19	9.47	[illegible]	[illegible]
	August	74.23	84.75	118.76	9.51	[illegible]	[illegible]
	September	74.56	85.17	119.34	9.55	[illegible]	[illegible]
	October	74.90	85.59	119.91	9.59	[illegible]	[illegible]
	November	74.23	86.02	120.49	9.63	[illegible]	[illegible]
	December	75.57	86.45	121.08	9.68	[illegible]	[illegible]
1973	January	75.92	86.88	121.66	9.72	[illegible]	[illegible]
	February	76.26	87.32	122.25	9.76	[illegible]	[illegible]
	March	76.61	87.76	122.85	9.81	[illegible]	[illegible]
	April	76.95	88.20	123.45	9.85	[illegible]	[illegible]
	May	77.30	88.64	124.05	9.90	[illegible]	[illegible]
	June	77.66	89.09	124.65	9.94	[illegible]	[illegible]
	July	78.01	89.54	125.26	9.99	[illegible]	[illegible]
	August	78.37	89.99	125.87	9.03	[illegible]	[illegible]
	September	78.72	90.44	126.48	9.08	[illegible]	[illegible]
	October	79.08	90.90	127.10	9.12	[illegible]	[illegible]
	November	79.45	91.36	127.72	9.17	[illegible]	[illegible]
	December	79.81	91.83	128.34	9.22	36.47	45.60
1974	January	80.18	92.29	128.97	9.27	[illegible]	[illegible]
	February	80.54	92.75	129.60	9.32	[illegible]	[illegible]
	March	80.91	93.23	130.24	9.36	[illegible]	[illegible]
	April	81.28	93.71	130.88	9.41	[illegible]	[illegible]
	May	81.66	94.19	131.52	9.46	[illegible]	[illegible]
	June	82.03	94.67	132.16	9.51	[illegible]	[illegible]
	July	82.41	95.15	132.81	9.56	[illegible]	[illegible]
	August	82.79	95.64	133.46	9.61	[illegible]	[illegible]
	September	83.17	96.12	134.12	9.67	[illegible]	[illegible]
	October	83.56	96.62	134.78	9.72	[illegible]	[illegible]
	November	83.94	97.11	135.44	9.77	[illegible]	[illegible]
	December	84.33	97.61	136.10	9.82	[illegible]	[illegible]
1975	January	84.72	98.11	136.77	9.87	[illegible]	[illegible]
	February	85.11	98.61	137.44	9.93	[illegible]	[illegible]
	March	85.51	99.11	138.12	9.98	[illegible]	[illegible]
	April	85.90	99.62	138.80	10.03	[illegible]	[illegible]
	May	86.30	100.13	139.48	10.09	[illegible]	[illegible]
	June	86.70	100.65	140.17	10.14	[illegible]	[illegible]
	July	87.10	101.16	140.85	10.20	[illegible]	[illegible]
	August	87.51	101.68	141.55	10.25	[illegible]	[illegible]
	September	87.91	102.21	142.24	10.31	[illegible]	[illegible]

[a] — Differences between farm and carcass values, carcass and retail values, and farm and retail values are not necessarily equal to the farm-carcass, carcass-retail, and farm-retail price spreads respectively, because the trend values for the spreads were derived by the least Squares second degree parabolic trend model rather than from the beef values.

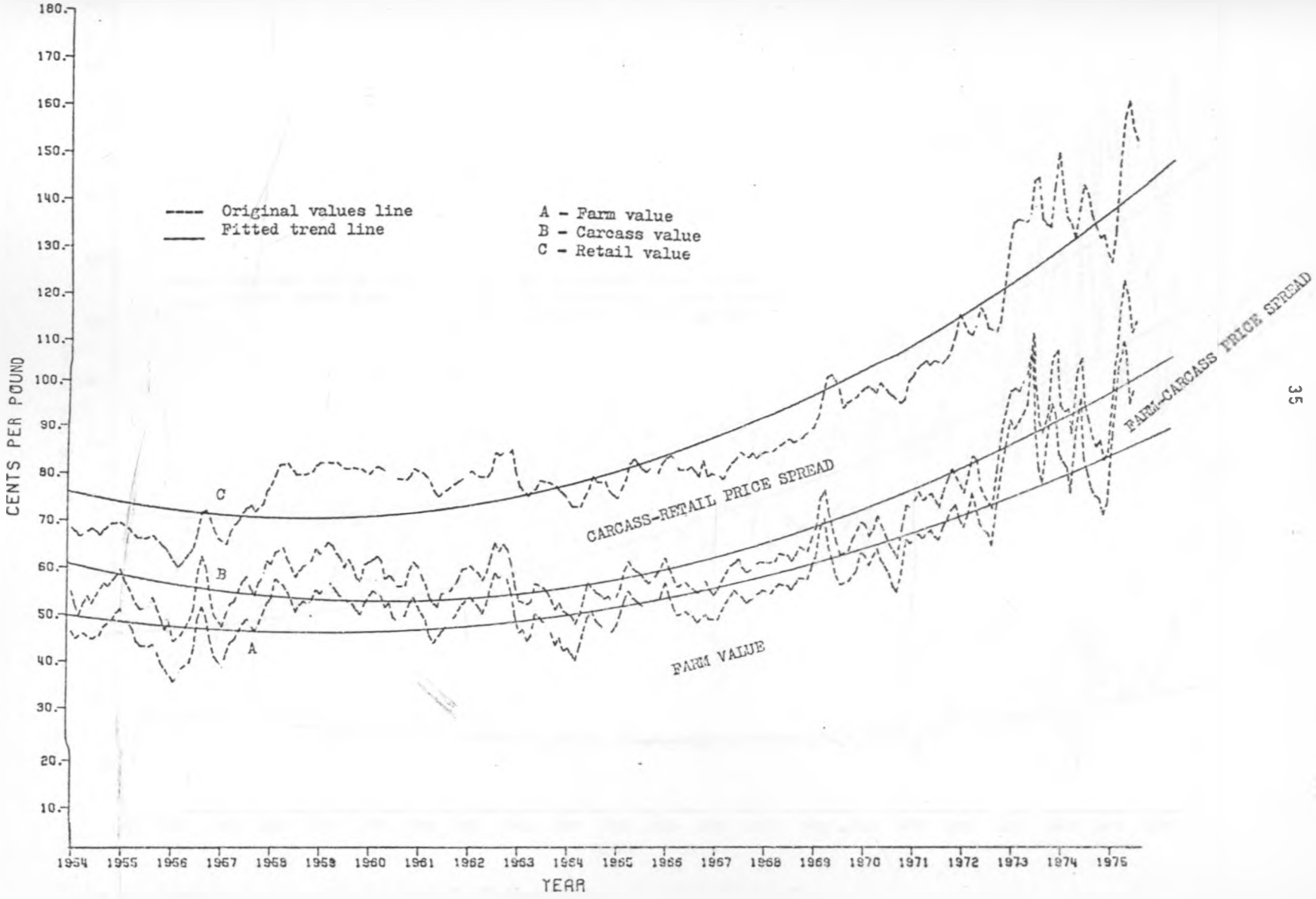

Figure 2. Secular trends in farm, carcass, and retail values for choice beef, U.S., 1954 - September 1975.

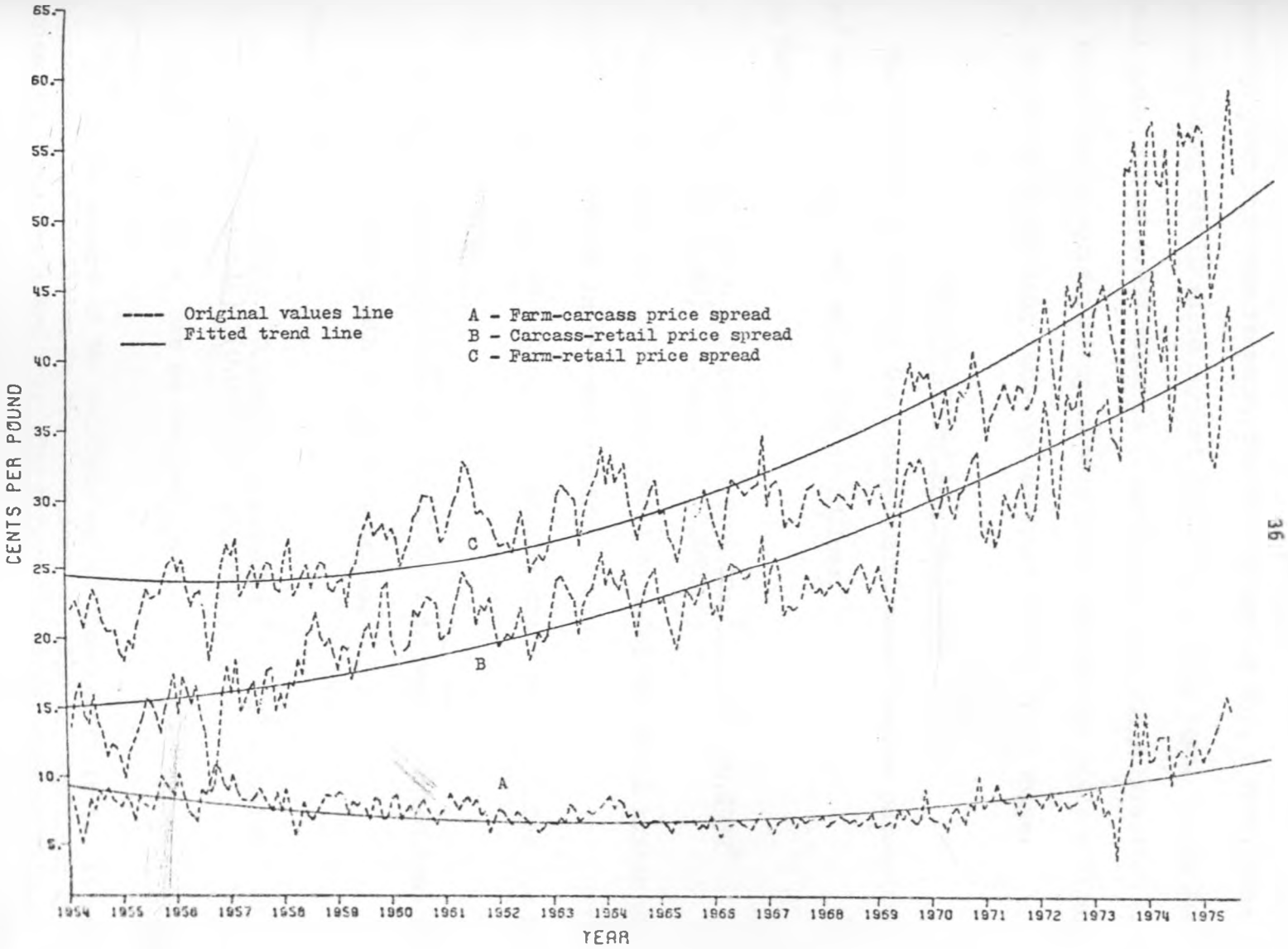

Figure 3. Secular trends in farm-carcass, carcass-retail, and farm-retail price spreads for choice grade beef, U.S., 1954 - September 1975.

its own model. And since the models were obviously not perfect fits to the original data, the values they yielded in Table 2 do not add up or subtract perfectly. For the same reasons, the subtraction of say, a farm value from a corresponding retail value may not result in a value equal to the farm-retail price spread trend value in Table 2, nor does the subtraction of a farm value from a corresponding carcass value necessarily yield a figure equal to the corresponding farm-carcass price spread trend value.

Secular Trends in Beef Values

The results of fitting the Least-Squares second degree parabolic trend model to the beef values are as follows:

Farm value:

$$T_i = \underset{(0.74748)}{51.90880} + \underset{(0.00661^i)}{0.14677x_i} + \underset{(0.00010^i)}{0.00100x_i^2} \qquad R^2 = 0.6982^a$$

where i = position of a month from 1 to n=261 the total number of months in the data used.

T_i = computed value of the secular trend component for the i th month.

x_i = time-centered position of the i th month counted from the median month of the time series.

Carcass value:

$$T_i = \underset{(0.62646)}{57.78462} + \underset{(0.00554^i)}{0.15951x_i} + \underset{(0.00008^i)}{0.00138x_i^2} \qquad R^2 = 0.8118$$

where i, T_i and x_i are as defined above.

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[a] R^2 is the square of the multiple correlation coefficient. It measures the proportion of variation in the dependent variable (T) explained by the independent variables (x and x^2). The figures in parentheses in this equation and in subsequent equations are standard errors of the parametric estimates immediately above them; the smaller the standard error, the greater the precision of the estimate.

Retail value:

$$T_i = \underset{(0.69244)}{80.20835} + \underset{(0.00613^1)}{0.25532x_i} + \underset{(0.00009^1)}{0.00168x_i^2} \qquad R^2 = 0.9997$$

where i, T_i, and x_i are as defined above.

By the t-ratio[1] test, parametric estimates in all of the above [illegible] value secular trend equations are significantly different from zero at the 1 percent level of significance. Thus, the slope and curvature of the trendline (given by the coefficients of x_i and x_i^2 in each equation above) are statistically significant. This indicates that by incorporating bx_i and cx_i^2 in the Least-Squares Model (see Chapter II), the residual sum of squares was significantly reduced, improving the quality of fit of the secular trend equations.

The parametric estimates in the trend equation for retail value are greater than those for the carcass value equation. This is an indication that between any two adjacent months, retail value changed by more cents than carcass value. Similarly, carcass value changed by more cents than farm value between any two adjacent months.

As said before, the computed trend values of the above models are shown in Table 2 and in Figure 2 above. It can be seen in Figure 2 that the fitted trend lines over-estimated and underestimated the original data in several periods. But this feature is inherent in the process of fitting a line to any observed data of this nature. The trend lines show that the direction and picture of change in each trend was definitely upward and rather concave in appearance to the origin. This concavity suggests that

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[1]The t-ratio used was the ratio of an estimate to its standard error. Its distribution provides a basis for testing whether a parametric estimate in a regression equation is significantly different from a specified value, such as zero in the above cases.

the trends in values were increasing at an increasing rate, i.e. that the average change in cents for each value between two adjacent months was larger than that for the previous month interval.

Secular Trends in Beef Price Spreads

The results of fitting the Least-Squares second degree parabolic trend model to the beef price spreads are as follows:

Farm-carcass price spread:

$$\underset{(0.11874)}{T_i = 6.39414} + \underset{(0.00105^1)}{0.00414x_i} + \underset{(0.00002^1)}{0.00023x_i^2} \qquad R^2 = 0.4716$$

where i, T_i, and x_i are as defined above.

Carcass-retail price spread:

$$\underset{(0.28488)}{T_i = 22.46735} + \underset{(0.00252^1)}{0.09571x_i} + \underset{(0.00004^1)}{0.00030x_i^2} \qquad R^2 = 0.8539$$

where i, T_i, and x_i are as defined above.

Farm-retail price spread:

$$\underset{(0.39309)}{T_i = 28.85361} + \underset{(0.00348^1)}{0.09896x_i} + \underset{(0.00005^1)}{0.00049x_i^2} \qquad R^2 = 0.7770$$

where i, T_i, and x_i are as defined above.

By the t-ratio test, parametric estimates in all of the above price spread secular trend equations are significantly different from zero at the 1 percent level of significance. As was stated above for the beef values, this indicates that the slope and curvature of the price spread trend lines are statistically significant.

The parametric estimates in the farm-retail price spread trend equation are higher than those in the carcass-retail price spread equation. This means that between any two adjacent months, farm-retail price spread changed by a larger absolute amount than did the carcass-retail spread. Likewise, carcass-retail price spread changed by more cents than did farm-carcass

price spread between any two adjacent months.

Price spread trend values generated by the above models are given in Table 2 and Figures 2 and 3 above. In Figure 2, differences between retail, carcass and farm values are shown as carcass-retail, and farm-carcass price spreads. These two add up to farm-retail price spread. Each of these spreads was graphed in Figure 3 as cents per retail pound for that spread. The base of each spread in Figure 3 is zero (for instance, the carcass-retail spread does not start at the farm-carcass line but at the origin). The farm-retail and carcass-retail trends were definitely upward and increased at an increasing rate as shown by their clearly defined concave appearance to the origin. However, the farm-carcass price spread trend was generally downward, until late 1960's when it turned gently upward, and was also increasing at an increasing rate in the 1970's up to the end of the study period.

Factors behind the Secular Trends in Beef Price Spreads and Values

In the process of defining beef price spreads earlier in this text, it was stated that the price spreads represent costs and profits of marketing beef. This is illustrated by Table 3 below, in which the major functions in beef marketing channel are listed by individual cost items per retail pound in 1973. It can be expected that trends in price spreads, therefore, will reflect long term changes in these marketing costs and profits. Trends in spreads are also affected by the addition of new marketing services and sustained changes in demand for services relative to supplies of these services.[1]

Figures 2 and 3 above indicate that trends in beef values were generally in the same direction as those for the spreads. In the long run, a price at a higher market level rose or fell faster than a price at a lower

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[1] Willard F. Williams and Thomas T. Stout, Economics of the Livestock-Meat Industry, (New York: The Macmillan Company, 1964), p. 593.

TABLE 3.—Components of farm-retail price spread per pound at retail for U.S. choice grade beef, 1973

Costs and Profit	Farm Value	Assembly of Live animal	Processing	Wholesaling	Retailing	Retail Value
	cents					
Labor	--	--	1.5	--	15.9	--
Packaging	--	--	0.2	--	2.8	--
Transportation	--	--	0.6	1.1[a]	--	--
Business taxes	--	--	0.1	--	1.0	--
Depreciation	--	--	0.3	--	0.5	--
Rent	--	--	0.2	--	0.7	--
Repairs	--	--	0.2	--	0.3	--
Advertising	--	--	0.1	--	2.1	--
Interest	--	--	0.3	--	0.2	--
Energy	--	--	0.2[b]	--	0.6	--
Other	--	--	1.6	--	2.5	--
Profit	--	--	0.5	--	1.7	--
Unallocated	--	--	--	8.9	--	--
Total	89.9	1.5	5.8	10.0	28.3	135.5

[a] Intercity.

[b] Includes all energy and water.

Source: U.S., Department of Agriculture, Economic Research Service, Marketing and Transportation Situation, MTS-195, Table 14 (Washington, D.C.: Government Printing Office, Nov. 1974), p. 35.

level, such that rising prices (hence values) were accompanied by rising spreads and vice versa.

Costs of marketing did not appear to have changed very much in the 1954-1962 period. However, since 1963, they have tended to generally increase at an increasing rate as reflected by the rate of change in spreads discussed earlier in the text.

Farm-retail price spread:

As has been stated above, the trend in farm-retail price spread has been upward since 1954, and especially so since 1963. The strong upward trend since 1963 was due to a number of factors. Strong inflationary conditions in the economy brought about rapid increases in marketing costs of meat packing and processing (Table 4 below)[1]. Of most importance was the increases in labor cost, which account for over 50 percent of the costs in the spread. Earnings of employees for meat packing and processing rose by 84 percent. Prices of supplies and services bought by marketing firms were also up sharply. Containers and packaging materials rose 59 percent; fuel, power and light more than doubled; rent, telephone, banking and other services rose 82 percent. Shipping and delivery costs continued to increase markedly. Rail freight rates for dressed meats declined from 1963 till 1967; but since then they have also been increasing rapidly.

Apart from rapidly rising costs of marketing, upward trends in farm-retail price spread accompanied upward trends in retail prices which in turn, accompanied upward trends in per capita beef consumption reflecting strong consumer demand boosted by rising consumer incomes (Table 5 below). Consumer disposable income per capita more than doubled with nearly

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[1] U.S., Department of Agriculture, Economic Research Service, Marketing and Transportation Situation, MTS-197 (Washington, D.C.: Government Printing Office, May 1975), pp. 16-19.

TABLE 4.--Farm-retail price spread and selected marketing costs, for U.S. choice grade beef, 1963-74

Year	Farm-retail price spread	Hourly Earnings		
		Meat packing	Meat processing	Food retailing
	cents	dollars	dollars	dollars
1963	30.1	2.82	2.64	1.90
1964	30.3	2.91	2.72	1.98
1965	28.3	2.99	7.78	2.06
1966	30.1	3.09	2.88	2.13
1967	29.6	3.24	3.03	2.23
1968	29.9	3.45	3.22	2.38
1969	34.0	3.66	3.45	2.54
1970	37.1	3.98	3.65	2.70
1971	36.5	4.20	3.93	2.90
1972	41.4	4.47	4.24	3.09
1973	45.6	4.68	4.45	3.26
1974	52.7	5.15	4.91	3.60

	Prices of supplies and services bought by marketing firms			Rail freight rates for:	
	Containers, packaging	Fuel, power and light	Rentals and services	Livestock	Dressed meats
	--Index 1967=100--				
1963	95	99	86	100	117
1964	96	98	88	99	113
1965	97	99	91	99	104
1966	99	99	95	99	100
1967	100	100	100	100	100
1968	100	99	106	104	103
1969	104	99	113	108	107
1970	108	108	120	119	117
1971	114	121	128	135	132
1972	117	126	138	140	136
1973	128	138	145	146	133
1974	151	202	157	-	-

Source: U.S., Department of Agriculture, Economic Research Service, Marketing and Transportation Situation, MTS-197, Table 10, (Washington, D.C.: Government Printing Office, May 1975), p. 19.

TABLE 5.--Per capita personal disposable income and per capita Civilian beef consumption, U.S., 1963-74

Year	Per capita personal disposable income	Per capita civilian beef consumption (carcass weight)
	Dollars	Pounds
1963	2,139	94.5
1964	2,284	99.9
1965	2,436	99.5
1966	2,604	104.2
1967	2,744	106.5
1968	2,945	109.7
1969	3,130	110.8
1970	3,376	113.7
1971	3,603	113.0
1972	3,816	116.0
1973	4,195	109.5
1974	4,621	116.8

Source: U.S., Department of Agriculture, Economic Research Service, "Marketing and Transportation Situation" reports.

one-half of the increase occurring since 1971. The increase in the spread means that increases in retail beef prices more than offset increases in live animal prices during this period.

As was stated in the problem statement, complaints about the widening farm-retail price spread by beef farmers and consumers alike have focused on profits of marketing firms which, allegedly, are excessive. To refute this charge, meat packers and retailers have often quoted their after-tax profits as a percentage of sales, a figure which usually comes out lower than if the profits are quoted as a percentage of stockholder's equity. Marketing firms claim that the costs of providing the services demanded by consumers have escalated with the inflationary pressures in the economy. But farmers too are quick to point out that their costs of production have been subject to the same pressures. For sure, it is hard to say which side is right without making some value judgements, and it is not the purpose of this study to do so. The following may help to explain the profit position of marketing firms during the period under study.

During 1964-71 after-tax profits of 15 leading food chains as a percentage of stockholders' equity ranged between 10 and 11.5 percent (Table 6). As a percentage of sales, these profits varied from 1.0 to 1.3 percent through most of the period. Profit rates by both measures fell substantially from 1972 to the end of 1974 and they were well below profit rates for other industry groups throughout the period 1960-73 according to

TABLE 6.--Profits after taxes of retail food chains and food manufacturers, U.S., 1964-74

Year	15 leading food chains	10 leading meat packers	All food manufacturing	All manufacturing
		Percent return on stockholders' equity		
1964	11.5	--	10.1	11.7
1965	11.3	--	10.7	13.1
1966	11.4	7.1	11.3	13.6
1967	10.3	11.5	10.9	11.3
1968	10.3	10.2	10.8	12.2
1969	10.4	8.8	10.9	11.5
1970	10.6	8.7	10.8	9.3
1971	10.1	10.8	11.0	9.7
1972	5.1	9.1	11.2	10.6
1973	8.2	10.6	12.8	12.6
1974	4.7[a]	12.2 (8 firms)	13.9	14.9
		Percent return on Sales		
1964	1.3	--	2.7	5.2
1965	1.3	--	2.7	5.6
1966	1.3	0.9	2.7	5.6
1967	1.1	1.4	2.6	5.0
1968	1.1	1.2	2.6	5.1
1969	1.1	1.2	2.6	4.8
1970	1.0	0.9	2.5	4.0
1971	0.9	1.3	2.6	4.1
1972	0.5	0.8	2.6	4.3
1973	0.7	1.2	2.6	4.7
1974	0.4[a]	1.4 (8 firms)	2.9	5.5

--Data not available

[a]Includes extraordinary loss from store closings by the Greater Atlantic and Pacific Tea Company. Profits after taxes for 14 stores, excluding A & P, amounted to 11.1 percent of annual stockholders' equity. Profits of 14 stores, excluding A & P, amounted to 0.90 percent of annual sales.

Source: U.S., Department of Agriculture, Economic Research Service, Marketing and Transportation Situation, MTS-198, Table 6, (Washington, D.C.: Government Printing Office, August 1975), p. 12.

a USDA Task Force report.[1] "Only recently have retailers' profits risen to the levels they held during the 1960's."[2]

Within the period 1964-74, meat packer profits were more unstable but were somewhat higher relative to sales than those of food retailers. The after-tax profits of 10 leading meat packers as a percentage of stockholders' equity varied from 7.1 to 12.2 percent.

As a percentage of sales, average profits after taxes were about half as large for food-manufacturing corporations as for all manufacturing corporations during 1964-74. But as a percentage of stockholders' equity, after tax profits of food-manufacturing corporations sometimes exceeded the overall average. Thus, the food manufacturers' ratio of profits to stockholders' equity was fairly close to the average for the manufacturing group, although their ratio of profits to sales was about half the average for the group. The USDA Task Force concluded that overall, profits in meat packing and food retailing have not been excessive relative to all manufacturing industries in the country.[3]

Carcass-retail price spread:

Most of the increase in farm-retail price spread as described above was due to the increase in the carcass-retail portion of it as the farm-carcass portion remained relatively stable but on the declining side during most of the period (Figure 3 above). Rapid increases in carcass-retail spread were largely affected by additional services that were provided during the period. "Trimming of retail cuts increased which required more labor.

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[1]USDA Task Force, "USDA Task Force Reports on Livestock-Meat Price Spreads," The National Provisioner, September 28, 1974, pp. 124-131.

[2]Ibid.

[3]Ibid.

The proportion of beef sold in chain stores and large independent supermarkets rose during this period, and self-service was introduced in many stores. Increased sales per store apparently made possible economies of scale that partly offset the rise in cost rates."[1] In addition, local delivery costs to retail stores increased substantially during the period.

Farm-carcass price spread:

As has been indicated above, the trend in farm-carcass price spread was slightly downward during most of the period, although it started leveling up on the upward trend in late 1960's. The decline in the spread was apparently due to improvements in efficiency within the meat packing industry that was brought about by vast changes. "Many new plants were built; and slaughtering, in many obsolete plants, was discontinued. Plants specializing in the slaughter of beef cattle increased in number. On-the-rail dressing, mechanical knives, and other technical improvements brought a reduction in labor requirements per unit of output. Marketings of beef cattle became more evenly distributed throughout the year enabling packers to use their facilities more efficiently."[2]

Projections and Implications of Trends in Beef Price Spreads to 1980

If the above described trends in beef price spreads continue till 1980, the projected values of the secular trend component could be as given in Table 7 below. These trend values were adjusted for the seasonal factor. The figures indicate that by December 1980, farm-carcass, carcass-retail, and farm-retail price spreads could be 41, 33, and 35 percent respectively

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[1] U.S., Department of Agriculture, Economic Research Service, "Farm-Retail Spreads for Food Products," January 1972, p. 26.

[2] Ibid., p. 29.

TABLE 7.— Projected monthly seasonal trend values for farm, carcass, and retail values, and farm-carcass, carcass-retail, and farm-retail price spreads for choice grade beef, U.S., October 1975 - December 1984.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass[a]	Carcass-Retail[a]	Farm-Retail[a]
		cents					
1975	October	96.20	100.76	141.68	10.03	41.59	51.
	November	96.70	100.64	142.56	10.56	41.92	52.
	December	96.74	101.33	143.99	10.57	42.67	53.
1976	January	89.40	105.42	143.88	11.90	38.19	50.
	February	90.75	106.73	146.00	10.51	41.73	52.
	March	91.48	105.68	147.49	10.07	40.55	49.
	April	92.73	107.05	147.65	10.57	40.72	51.
	May	91.23	106.31	147.60	11.00	41.40	52.
	June	91.56	106.51	148.63	10.98	40.90	51.
	July	93.64	109.14	149.49	11.12	42.19	53.
	August	94.07	109.55	150.69	10.92	41.04	51.
	September	92.98	109.29	152.43	10.97	42.50	53.
	October	91.13	107.15	150.48	10.73	43.00	53.
	November	91.66	107.02	151.20	11.07	44.77	55.
	December	91.76	107.82	152.71	11.06	43.37	54.
1977	January	94.51	112.10	152.59	12.29	40.21	52.
	February	95.95	113.49	154.84	11.33	42.03	53.
	March	96.72	112.38	156.41	10.76	42.69	53.
	April	98.04	113.82	156.58	11.09	42.87	53.
	May	96.51	113.06	156.52	11.76	43.58	55.
	June	96.79	113.26	157.61	11.63	43.07	54.
	July	99.00	116.06	158.52	11.89	44.41	56.
	August	99.45	116.48	159.73	11.66	43.20	54.
	September	98.29	116.22	161.62	11.72	44.74	56.
	October	96.34	113.94	159.55	11.48	46.10	57.
	November	96.90	113.80	160.32	11.84	47.12	58.
	December	96.95	114.64	161.90	11.84	45.65	57.
1978	January	99.91	119.21	161.73	13.14	42.32	55.
	February	101.42	120.68	164.16	12.12	45.14	57.
	March	102.24	119.49	165.82	11.50	44.92	56.
	April	103.63	121.01	166.00	11.86	45.11	56.
	May	102.02	120.21	165.93	12.57	45.85	58.
	June	102.32	120.42	167.08	12.45	45.31	57.
	July	104.64	123.39	168.04	12.72	45.73	58.
	August	105.13	123.84	169.38	12.49	45.46	57.
	September	103.90	123.55	171.31	12.54	47.06	59.
	October	101.84	121.13	169.12	12.27	48.49	60.
	November	102.42	120.98	169.92	12.66	49.55	62.
	December	102.47	121.87	171.60	12.67	48.01	60.
1979	January	105.60	126.71	171.46	14.04	44.51	58.
	February	107.20	128.27	173.98	12.96	47.46	60.
	March	106.06	127.01	175.72	12.31	47.24	59.
	April	109.52	128.62	175.91	12.68	47.43	60.
	May	107.81	127.76	175.83	13.45	48.21	61.
	June	108.13	127.97	177.03	13.30	47.64	60.
	July	110.59	131.13	178.04	13.59	47.12	60.
	August	111.10	131.60	179.46	13.36	47.70	61.
	September	109.79	131.29	181.51	13.41	49.48	62.
	October	107.60	128.71	179.16	13.13	50.97	64.
	November	108.22	128.54	180.61	13.55	52.08	65.
	December	108.28	129.47	181.77	13.55	50.46	64.
1980	January	111.50	134.62	181.63	15.03	46.77	61.
	February	113.27	136.27	184.27	13.87	48.89	62.
	March	114.16	134.92	186.12	13.10	49.04	62.
	April	115.71	136.63	186.51	13.56	49.24	62.
	May	113.91	135.70	186.22	14.38	50.66	65.
	June	114.23	135.93	187.48	14.22	50.65	64.
	July	116.02	139.28	190.54	14.54	51.51	66.
	August	117.35	139.76	190.93	14.28	50.39	64.
	September	115.93	139.42	192.19	14.34	52.97	67.
	October	113.56	136.68	189.70	14.04	53.04	67.
	November	114.30	136.49	190.93	14.48	54.71	69.
	December	114.36	137.46	191.45	14.49	53.99	68.

[a] — Differences between farm and carcass values, carcass and retail values, and farm and retail values are not necessarily equal to the farm-carcass, carcass-retail, and farm-retail price spreads as derived from the trend values because the latter were derived by the Census X-11 variant seasonal adjustment program from the beef values.

above the September 1975 levels, but the relative division of the farm-retail spread between the other two spreads would remain about the same by December 1980 as were in September 1975, namely at about 20 percent farm-carcass and 80 percent carcass-retail spread. A considerable slow down in the rate of inflation in the economy could help hold down costs of marketing services and so slow down the rate of increase in the spreads. Likewise, a strong cyclical change such as a high liquidation of cattle inventory could boost up farm prices and tend to slow down or curb increases in the spreads.

These trends have definite implications to the cattle producer, meat marketer, and consumer. The producer can expect that his share of the consumer's beef dollar is likely to continue dwindling. To try to correct the situation, as an individual, he can cut down on his costs of production and/or do his own marketing where it is economically feasible to do so. As a group, cattle producers could use some kind of bargaining forum to try to secure better prices during periods of increasing costs since they, like beef marketers, are affected by increasing costs of production. The trends point to the marketer that costs of doing business are likely to continue rising and he must be aware that the prices he charges must cover these rising costs in the long run for his business to stay solvent. Consumers can expect that the increasing costs will be passed on to them in form of higher retail prices. So long as they continue demanding more and better marketing services, they must be ready to pay for them, without feeling that somebody else is excessively benefitting at their expense.

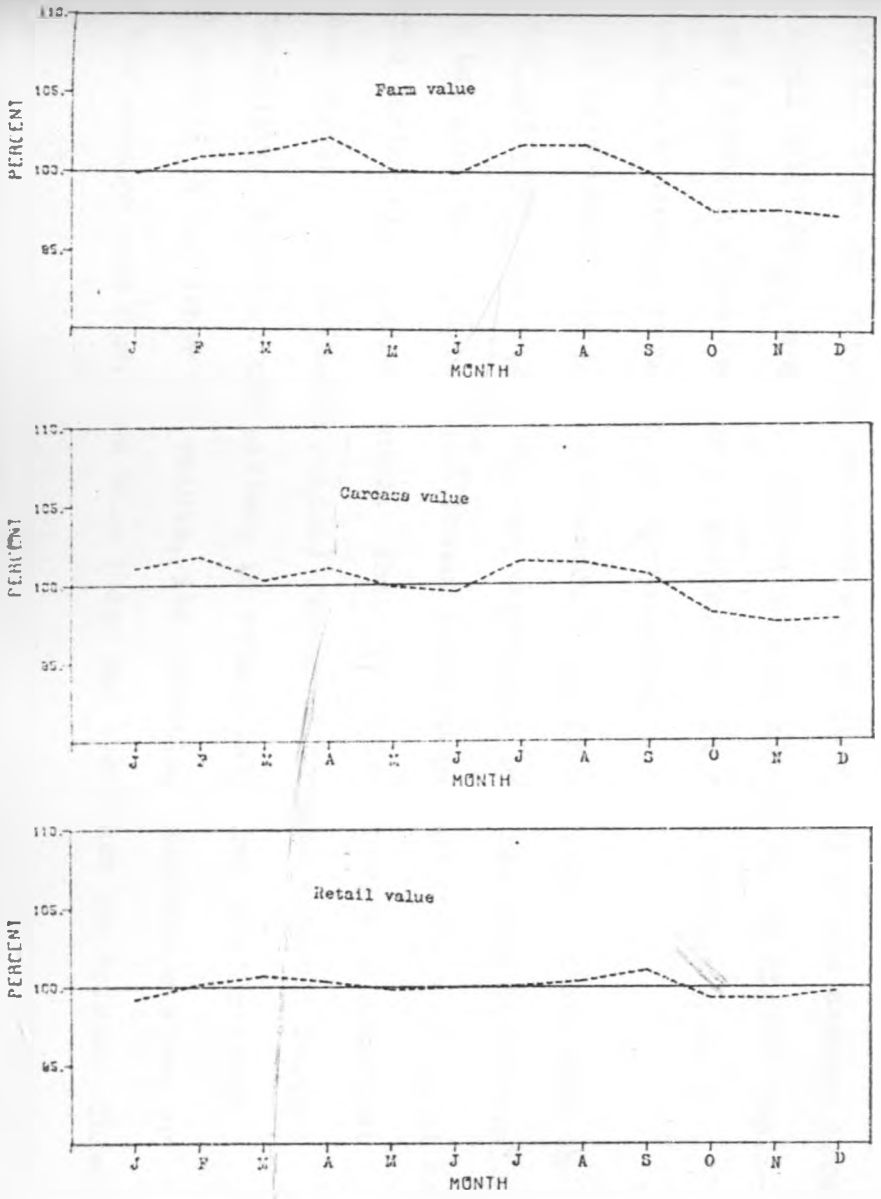
CHAPTER IV

SEASONAL VARIATIONS IN BEEF PRICE SPREADS

The purpose of isolating the seasonal component was to describe and chart the intra-yearly patterns in price spread changes in order to facilitate analysis of factors that may be behind these changes. The results of isolating the seasonal factor are presented in Table 8 and Figure 4 below. Table 8 gives the computed seasonal indices for the beef price spreads and values, while Figure 4 shows graphed indices by month for the values and spreads.

TABLE 8.--Seasonal indices of farm, carcass, and retail values and farm-carcass, carcass-retail, and farm-retail price spreads for choice grade beef, U.S., 1954-September 1975

Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
	----------Percent of annual average----------					
January	99.82	101.05	99.19	109.12	93.86	100.26
February	100.87	101.78	100.16	100.11	99.68	101.70
March	101.21	100.27	100.68	94.53	98.80	95.56
April	102.11	101.03	100.30	96.86	98.79	97.85
May	100.06	99.84	99.78	102.13	100.00	98.95
June	99.89	99.51	99.98	100.43	98.40	101.03
July	101.69	101.45	100.07	102.11	101.05	98.22
August	101.69	101.30	100.38	99.75	97.88	97.85
September	100.04	100.55	101.04	99.60	100.93	100.74
October	97.60	98.08	99.26	96.94	103.55	102.34
November	97.71	97.46	99.25	99.46	105.39	103.92
December	97.31	97.68	99.75	98.95	101.67	101.56



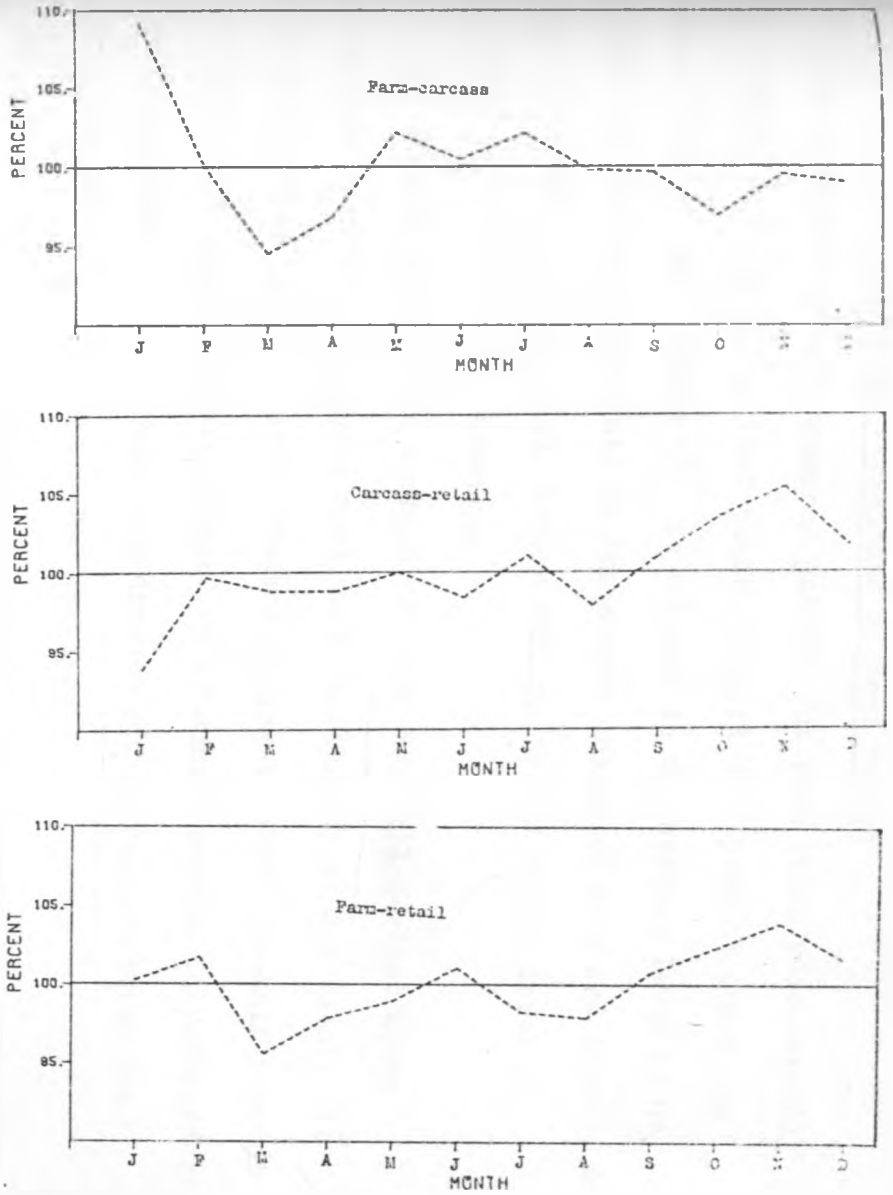


Figure 4. Seasonal variations in farm, carcass, and retail values, and farm-carcass, carcass-retail, and farm-retail price spreads for choice grade beef, U.S., 1954 - September 1975. (percent of Annual Average)

Seasonal Variations in Beef Values

The amplitude of the seasonal pattern for farm value rose steadily from January and reached highest point in April at 2 percent above the average index of 100 (Figure 4). It dropped to the average level in May and June and strengthened again in the summer months of July and August, at nearly 2 percent above average, before falling to its lowest level in December at 3 percent below average.

The carcass value trend started off the year at 1 percent above average, and rose to its highest amplitude in February at 2 percent. It stayed above average until April before dropping to about one-half percent below average in June. It strengthened up in summer months, July-September at about 1 percent above average, and dropped off in fall, hitting its lowest in November at 3 percent below average.

The retail value seasonal pattern started the year at its lowest level of about 1 percent below average. It rose to just under 1 percent above average in March, and dropped back and stayed generally at the average level from April until July, when it started to rise slowly to its highest amplitude of 1 percent above average in September. It fell to just under 1 percent below average from October to December.

It is evident from the above account and from Figure 4 above that the seasonal patterns in farm and carcass values not only had same directional change but also their highest and lowest percentage amplitudes were equal and occurred during nearly same months. This may be interpreted to mean that farm and carcass values (hence prices) responded to same seasonal factors simultaneously. Although the pattern in retail value had similar directional change as the other two values, its percentage amplitudes above or below the average were much less tahn those for the other two values. This

is an indication that retail value varied less (was more stable) seasonally than the other two values.[1]

Seasonal Variations in Beef Price Spreads

The seasonal pattern for the farm-carcass price spread started the year at its highest level of 9 percent above average in January. It then fell rapidly to hit its lowest amplitude at 5 percent below average in March. It rose in April and stayed above average from May to July before declining to 3 percent below average in October.

While the amplitude for the farm-carcass spread was highest in January, it was lowest for the carcass-retail spread at 6 percent below average. This shows that carcass value was very high relative to farm and retail values during January. It (carcass-retail spread) stayed below average until July when it rose to 1 percent above average. It fell to 2 percent below in August, before rising to its highest level of the year in November at 5 percent above average.

The pattern for farm-retail spread started the year at about the average index of 100. It rose to 2 percent above the average in February, then fell to its lowest in March at 4 percent below average. It rose to 1 percent above in June, fell back to 2 percent below in August, then rose to its highest level of the year in November at 4 percent above the average.

Factors behind the Seasonal Variations in Beef Price Spreads

Seasonal variations in beef price spreads are influenced by seasonal variations in beef values (and hence prices). "Seasonal price movements are a direct reflection of seasonality in marketings, and to a lesser

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[1]Factors or reasons for these phenomena are given in the appropriate section below.

degree, seasonality in demand."[1]

As described above and shown in Figure 4, generally the seasonal pattern in farm value was strong in spring months (February-April) and again in summer months (July-September) but weak in fall and winter months (October-January). Beef production and marketings are lowest in February partly because of the smaller number of marketing days, and appears to reach a peak in October.[2] It was also shown above that the seasonal variation in farm and carcass values was greater than in retail value.[3] "This difference results from retail prices changing more slowly than live (and wholesale) prices--a lag which partly results from the length of time required for a change in supply to move from the farm to the retail level. Other factors are also important. For instance, retailers tend to prefer stable prices and will accept changed margins for a short period before changing prices. Retailers also partially depend on specials to move larger supplies rather than change their regular prices, when increases in supply may be of short duration."

Seasonal variations in price spreads were generally inversely related to those in beef values. Farm-carcass tended to decrease when farm and carcass values were rising and to increase when these values were declining. This indicates that seasonally farm prices rose and fell faster than wholesale beef prices. Similarly, carcass-retail price spread decreased when carcass and retail values were increasing and vice versa, demonstrating

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[1]John H. McCoy, "Livestock and Meat Marketing," January 1973, p. 63.

[2]U.S., Department of Agriculture, Economic Research Service, Price Spreads for Beef and Pork, Revised Series 1949-69, Miscellaneous Publication No. 1174, (Washington, D.C.: Government Printing Office, May 1970), p. 7.

[3]Ibid.

that seasonally beef wholesale prices rose and fell faster than retail prices.

Contrary to common thinking, the larger amplitudes in the seasonal pattern of price spreads in relation to those for beef values (Figure 4) indicate that there was more seasonal variation in spreads than in values. This may be explained as follows: seasonality in supply and marketings of cattle and beef declined over the period,[1] resulting in less variation in farm and wholesale beef prices; on the other hand, very high energy costs in recent years caused more seasonal variations in marketing costs and hence price spreads.[2]

Change in Seasonal Variations over the years

Seasonal variations in price spreads and values have declined over the past two decades. A comparison of the seasonal amplitudes for the 1954-75 period obtained by this study above, with those for the 1947-58 period in a study by the USDA[3] verify this statement. The comparison is summarized in Table 9 below.

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[1]This point is explained below, whereby a comparison is made between the seasonality in spreads and values in an earlier period and the period covered by this study.

[2]Other costs may also be a factor, but energy costs have a distinct seasonal pattern e.g., building heating in winter.

[3]U.S., Department of Agriculture, Agricultural Marketing Service, Marketing Economics Research Division, Seasonal Variation in Farm Food Prices and Price Spreads, Miscellaneous Publication No. 840 (Washington, D.C.: Government Printing Office, January 1961), p. 15, Table 5.

TABLE 9.--Seasonal Amplitudes in farm and retail values and farm-retail price spread in the periods 1947-58 and 1954-75

	Period	1947-58*	1954-75
Farm Value	Highest amplitude (%)	4	2
	Lowest amplitude (%)	6	3
Retail Value	Highest amplitude (%)	3	1
	Lowest amplitude (%)	4	1
Farm-Retail price spread	Highest amplitude (%)	5	4
	Lowest amplitude (%)	4	4

*Source: Computed from reference 3 on the preceeding page.

Farm (and carcass) values respond readily to changes in supplies of choice grade slaughter cattle and consequently to changes in seasonality of choice grade marketings. Over the years, expanded feeding operations by farmers and commercial feedlots have tended to transform seasonally concentrated supplies of grass-fed cattle marketings into a more evenly distributed supply of higher grade and heavier cattle.[1] With more orderly marketings of choice grade cattle throughout the year, fluctuations in the seasonal pattern of farm value (and carcass value) have been reduced. This reduced seasonal variation in farm value has led to more stable retail value and hence more stable farm-retail price spread than in the earlier period. "Another reason for the decline in seasonality may have been the increase in the volume of processed meat and improved methods of preservation. The conversion of large quantities of fresh meat into less perishable forms and storage of this meat during seasons of peak production tend to stabilize supply and prices of fresh meat."[2]

[1] Ibid., p. 14.

[2] Ibid.

It must be pointed out that the presence of a seasonal pattern in spreads or values does not mean, necessarily, that the spreads or values as observed in the market during any particular year will follow the charted seasonal pattern. Adherence to the seasonal pattern depends on divergence of the relative strength of forces causing seasonal variations and those causing other types of movements from the charted average. Nevertheless, a knowledge of past seasonal patterns can serve as an indication of the likely future seasonal movements and, therefore, as a guide in planning individual business production and marketing programs. A cattle producer can synchronize his production and marketing programs to take advantage of certain favorable price periods without affecting the general seasonal pattern for the whole cattle industry. He can do this provided that the gain from such action more than offsets any resultant increases in costs. However, if a large number of cattle producers make the same adjustment to a seasonal pattern, they may, as a group, alter the pattern and therefore, fail to achieve the anticipated results.

CHAPTER V

CYCLICAL FLUCTUATIONS IN BEEF PRICE SPREADS

The cyclical components in beef price spread series were isolated so that the recurring-up-and-down movements in these series that last 2 or more years could be identified, recorded and explained. The results of these isolated cyclical factors are presented in Table 10 and Figures 5 and 6 below. Table 10 gives the computed monthly cyclical percentages[1]; Figures 5 and 6 show the charted cyclical percentages in beef values and price spreads respectively.

Cyclical Fluctuations in Beef Values and their Causes

The cyclical fluctuations in beef values (Figure 5) generally inversely followed cyclical movements in the numbers of all cattle and calves on U.S. farms, or the cattle cycle (Figure 7 below). A cattle cycle may be divided into two phases: (1) the upward or accumulation phase, and (2) the downward or liquidation phase.[2] Thus, cyclical trends in beef values were generally downward during the accumulation phases and upward during the liquidation phases. In reference to Figure 7, the 1955-75 period may be divided up into liquidation and accumulation phases as follows:

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[1]Cyclical percentages are percentages of the $T_i \times S_i$ product. See Chapter II, p. 22.

[2]John H. McCoy, "Livestock and Meat Marketing," 1972, p. 54.

TABLE 10 -- Cyclical percentages for farm, carcass, and retail values, and farm-carcass, carcass-retail, and farm-retail price spreads for choice grade beef, U.S., January 1954 - September 197[illegible].

(percent of $T_i \times S_i$ product)

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
		percent					
1954[a]	May	91.62	88.08	89.64	83.78	95.37	90.95
	June	92.36	88.89	89.33	85.20	93.42	90.22
	July	95.79	90.65	90.59	87.68	90.11	89.16
	August	95.69	92.76	91.07	91.01	85.61	87.28
	September	97.31	94.42	91.80	93.05	82.48	86.03
	October	98.35	95.53	92.17	93.12	80.92	84.79
	November	99.37	95.99	92.50	93.24	78.23	83.46
	December	99.87	96.65	92.51	93.81	77.29	82.73
1955	January	99.89	96.72	92.67	93.65	77.81	83.12
	February	99.13	96.06	92.78	92.38	80.96	84.48
	March	97.88	95.00	92.55	91.26	83.17	85.96
	April	96.30	93.79	92.11	91.85	85.55	87.72
	May	94.61	92.89	91.77	95.30	86.63	89.77
	June	92.68	91.89	91.45	98.29	89.32	92.36
	July	91.11	91.00	91.08	100.84	91.49	94.71
	August	89.13	89.74	90.70	103.28	94.51	97.26
	September	87.49	88.63	90.20	104.57	96.33	98.77
	October	85.50	87.18	89.55	106.16	98.17	100.13
	November	84.07	85.93	88.63	106.54	98.36	100.82
	December	83.08	85.17	87.93	106.79	98.34	100.52
1956	January	82.38	84.33	87.51	104.44	99.40	100.62
	February	81.63	83.71	87.19	103.51	100.32	100.70
	March	81.48	83.54	86.92	102.29	99.13	99.96
	April	83.46	85.32	87.33	102.78	94.67	97.31
	May	86.49	88.36	88.49	106.29	88.94	94.71
	June	89.50	91.19	90.04	108.90	86.25	93.62
	July	92.06	93.76	91.63	110.47	84.77	93.29
	August	93.55	95.40	93.01	112.71	85.37	94.13
	September	94.20	96.46	94.05	115.89	86.29	95.63
	October	94.16	96.85	94.71	119.59	87.40	97.20
	November	94.64	97.26	95.02	119.67	87.43	97.61
	December	95.05	97.72	95.62	120.19	88.96	98.48
1957	January	94.29	96.87	96.03	118.42	93.89	101.22
	February	92.76	95.33	95.97	115.54	99.02	103.56
	March	92.08	94.58	95.89	113.19	100.52	104.30
	April	92.76	95.15	96.21	113.21	99.91	104.03
	May	94.10	96.15	96.97	111.99	99.52	103.44
	June	95.99	97.46	97.96	110.21	99.34	102.80
	July	98.68	100.02	99.03	110.62	96.02	100.80
	August	101.19	102.09	100.53	109.15	96.29	100.23
	September	103.48	104.10	102.09	109.28	96.29	101.07
	October	105.53	105.65	103.42	108.74	96.53	101.97
	November	108.50	107.80	104.93	105.50	95.80	101.45
	December	110.65	109.32	106.56	102.45	98.33	101.43
1958	January	112.59	110.91	108.08	101.11	99.72	101.66
	February	114.42	112.49	109.65	100.21	101.46	101.46
	March	115.91	113.74	111.17	98.96	103.20	101.06
	April	116.09	113.66	112.35	97.20	108.34	101.67
	May	116.23	113.72	113.15	97.51	110.80	102.68
	June	116.66	114.01	113.69	98.74	112.32	101.98
	July	116.69	114.56	114.22	100.91	113.35	99.95
	August	116.17	114.68	114.43	105.20	114.15	99.34
	September	116.03	114.89	114.54	107.83	113.97	99.15
	October	115.52	114.50	114.61	109.25	114.98	98.61
	November	115.62	114.76	114.53	110.44	113.85	97.67
	December	116.19	115.72	114.55	113.44	111.46	98.11
1959	January	117.90	117.39	115.07	114.15	108.34	98.70
	February	118.59	118.37	115.62	115.66	107.79	99.35
	March	118.30	118.38	115.94	114.89	108.43	100.61
	April	118.15	117.94	115.91	112.50	109.70	103.71
	May	117.85	117.68	115.82	112.63	109.76	105.55
	June	117.40	117.39	115.70	113.61	110.19	106.52
	July	116.95	116.92	115.60	111.15	111.61	108.32
	August	116.01	116.03	115.45	110.60	113.78	109.78
	September	115.12	115.13	115.24	109.90	115.80	110.85
	October	113.93	114.20	114.70	111.77	115.95	111.16
	November	113.79	113.93	114.29	110.51	114.96	110.65
	December	113.97	114.03	113.93	110.04	113.99	110.11

TABLE 10 -- Continued.

Year	Month	Farm Value	Business Value	Retail Value	Farm-Business	Business-Retail	Farm-Retail
		percent					
1960	January	114.47	114.57	113.93	111.67	112.33	108.86
	February	113.78	115.89	115.83	109.59	113.83	104.82
	March	115.43	115.01	115.47	108.59	114.12	110.12
	April	112.31	112.49	112.99	111.16	114.02	111.58
	May	111.96	112.91	112.42	112.19	117.03	112.85
	June	110.76	111.24	112.00	112.53	113.90	113.34
	July	110.36	110.70	111.79	109.24	114.44	113.53
	August	110.14	110.56	111.68	109.82	114.59	113.47
	September	109.97	110.27	111.60	109.12	115.26	113.42
	October	109.26	109.73	111.37	111.17	115.46	113.66
	November	108.68	109.71	111.13	113.92	115.04	114.65
	December	107.71	109.30	110.90	114.33	115.92	115.08
1961	January	106.89	108.60	110.60	114.11	116.67	115.73
	February	105.71	107.89	110.17	115.77	117.16	116.26
	March	104.13	106.61	109.41	115.84	117.45	116.99
	April	102.74	105.75	108.64	119.07	117.10	117.62
	May	101.08	104.23	107.89	118.86	118.17	118.43
	June	99.84	103.23	107.10	120.02	117.30	118.70
	July	99.51	102.56	106.60	115.36	118.13	118.03
	August	99.99	102.66	105.27	112.69	116.72	115.95
	September	100.91	103.27	106.16	111.42	114.60	113.69
	October	102.32	104.25	106.09	110.50	111.16	110.46
	November	104.27	105.74	106.50	106.68	108.51	108.58
	December	106.39	107.46	107.06	107.07	106.31	106.18
1962	January	107.62	108.41	107.53	105.42	105.52	105.20
	February	108.16	109.04	107.91	105.66	105.35	104.89
	March	108.56	109.33	107.93	104.15	104.40	104.22
	April	109.41	110.20	108.03	105.28	102.34	102.99
	May	110.73	111.28	108.56	104.82	101.09	101.98
	June	112.11	112.30	109.06	103.39	100.17	101.21
	July	113.76	113.74	109.73	101.52	99.31	100.32
	August	114.97	114.66	110.12	100.56	98.50	99.14
	September	115.17	114.61	110.73	99.39	99.94	99.51
	October	114.48	113.69	110.58	98.17	101.36	99.97
	November	113.24	112.54	109.93	98.30	102.07	101.12
	December	111.81	111.29	109.40	99.47	103.98	102.33
1963	January	109.27	109.30	108.47	100.68	105.91	104.47
	February	106.01	106.73	107.01	102.57	107.58	105.94
	March	103.55	104.74	105.64	103.48	107.40	106.39
	April	100.72	102.30	104.35	104.72	109.19	108.10
	May	98.09	100.07	103.19	106.10	110.50	109.46
	June	96.57	98.99	101.90	108.67	109.55	109.70
	July	95.86	98.66	101.42	110.02	108.79	109.70
	August	95.49	98.40	101.28	110.92	108.92	109.64
	September	95.11	98.03	100.95	111.26	108.84	109.20
	October	94.36	97.34	100.66	112.59	109.35	109.45
	November	93.49	96.57	100.18	113.41	109.54	110.33
	December	91.40	95.05	99.34	116.71	110.99	111.91
1964	January	89.33	93.40	98.33	118.31	111.57	112.88
	February	87.95	92.15	97.35	117.51	111.38	112.31
	March	87.06	91.31	96.54	116.35	110.38	111.66
	April	87.18	91.37	95.97	116.47	108.38	110.17
	May	88.25	92.02	95.84	114.24	106.05	107.93
	June	89.07	92.57	95.85	113.18	104.30	106.73
	July	90.37	93.48	96.09	109.73	102.93	105.15
	August	91.41	94.14	96.48	107.48	102.82	104.07
	September	92.60	94.71	96.76	105.60	102.26	102.49
	October	93.62	95.21	96.82	101.38	100.86	100.49
	November	94.20	95.61	96.72	100.77	99.43	99.75
	December	94.62	95.85	96.64	99.35	98.97	98.79
1965	January	95.28	96.28	96.65	97.78	97.89	97.69
	February	95.95	96.94	96.82	97.62	96.97	96.73
	March	96.21	97.27	97.06	97.67	96.67	96.87
	April	96.57	97.53	97.12	97.54	96.39	96.67
	May	97.13	97.96	97.04	97.36	94.89	95.43
	June	97.97	98.65	97.29	97.33	93.69	94.96
	July	98.91	99.57	97.83	96.75	93.44	94.96
	August	99.81	100.21	98.42	96.79	93.96	94.77
	September	100.14	100.48	98.67	96.65	94.29	94.73
	October	99.94	100.01	98.86	96.24	94.41	95.25
	November	99.85	99.89	98.92	94.97	94.27	93.83
	December	99.81	99.52	98.75	94.18	93.35	94.95

TABLE 10.— Continued.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
				Percent			
1966	January	99.22	99.10	98.03	9[illegible]	[illegible].77	95.[illegible]
	February	98.[illegible]	98.40	97.[illegible]	9[illegible].5[illegible]	[illegible].57	[illegible]
	March	97.35	97.43	97.[illegible]	[illegible]	[illegible]	[illegible]
	April	96.66	96.79	96.[illegible]	9[illegible].62	97.[illegible]	[illegible]
	May	96.02	96.17	96.55	9[illegible].[illegible]	97.91	[illegible]
	June	95.49	95.57	96.12	9[illegible].[illegible]	97.[illegible]	[illegible]
	July	94.37	94.72	95.[illegible]	9[illegible].[illegible]	97.[illegible]	[illegible]
	August	92.75	93.44	95.27	9[illegible].[illegible]	[illegible]	[illegible]
	September	91.89	92.65	94.49	9[illegible].[illegible]	[illegible]	[illegible]
	October	90.99	91.70	93.[illegible]	9[illegible].[illegible]	[illegible]	[illegible]
	November	90.34	91.00	93.17	9[illegible].[illegible]	9[illegible].[illegible]	97.[illegible]
	December	89.89	90.61	92.65	9[illegible].[illegible]	9[illegible].[illegible]	97.[illegible]
1967	January	89.77	90.51	92.09	9[illegible].[illegible]	9[illegible].[illegible]	[illegible]
	February	89.[illegible]	90.58	91.79	9[illegible].[illegible]	9[illegible].[illegible]	[illegible]
	March	89.[illegible]	90.80	91.[illegible]	9[illegible].[illegible]	[illegible]	[illegible]
	April	90.45	91.17	91.57	9[illegible].[illegible]	[illegible]	[illegible]
	May	91.22	91.67	91.29	9[illegible].[illegible]	[illegible]	[illegible]
	June	91.[illegible]	92.13	91.[illegible]	9[illegible].[illegible]	[illegible]	[illegible]
	July	92.[illegible]	92.[illegible]	91.[illegible]	[illegible]	[illegible]	[illegible]
	August	93.47	93.76	91.96	9[illegible].[illegible]	[illegible]	[illegible]
	September	94.24	94.23	92.[illegible]	9[illegible].[illegible]	[illegible]	[illegible]
	October	94.[illegible]	94.[illegible]	92.44	9[illegible].[illegible]	[illegible]	[illegible]
	November	94.62	94.33	92.45	9[illegible].[illegible]	[illegible]	[illegible]
	December	94.41	94.12	92.32	9[illegible].[illegible]	[illegible]	[illegible]
1968	January	94.[illegible]	93.90	92.22	9[illegible].[illegible]	[illegible]	[illegible]
	February	93.[illegible]	93.[illegible]	91.[illegible]	9[illegible].[illegible]	[illegible]	[illegible]
	March	93.44	93.33	91.72	9[illegible].[illegible]	[illegible]	[illegible]
	April	93.45	93.21	91.[illegible]	9[illegible].[illegible]	[illegible]	[illegible]
	May	93.40	93.06	91.37	9[illegible].[illegible]	[illegible]	[illegible]
	June	93.64	93.25	91.[illegible]	9[illegible].[illegible]	[illegible]	[illegible]
	July	94.00	93.56	91.43	9[illegible].[illegible]	[illegible]	[illegible]
	August	94.55	93.96	91.48	9[illegible].[illegible]	[illegible]	[illegible]
	September	94.94	94.13	91.65	9[illegible].[illegible]	[illegible]	[illegible]
	October	95.05	93.98	91.65	9[illegible].[illegible]	[illegible]	[illegible]
	November	95.55	94.31	91.78	8[illegible].[illegible]	[illegible]	[illegible]
	December	95.20	94.85	92.06	8[illegible].[illegible]	[illegible]	[illegible]
1969	January	98.14	96.51	92.94	8[illegible].[illegible]	[illegible]	[illegible]
	February	100.31	98.38	94.16	8[illegible].[illegible]	[illegible]	[illegible]
	March	101.11	99.23	95.32	8[illegible].[illegible]	[illegible]	[illegible]
	April	101.22	99.29	96.24	8[illegible].[illegible]	[illegible]	[illegible]
	May	100.52	98.75	96.88	8[illegible].[illegible]	[illegible]	[illegible]
	June	100.26	98.38	97.10	8[illegible].[illegible]	[illegible]	[illegible]
	July	100.02	98.27	97.54	8[illegible].[illegible]	[illegible]	[illegible]
	August	99.51	97.72	97.69	8[illegible].[illegible]	[illegible]	[illegible]
	September	98.49	96.92	98.04	9[illegible].[illegible]	[illegible]	[illegible]
	October	96.37	94.89	97.52	9[illegible].[illegible]	[illegible]	[illegible]
	November	94.56	93.32	96.72	9[illegible].[illegible]	[illegible]	[illegible]
	December	93.60	92.53	95.93	9[illegible].[illegible]	[illegible]	[illegible]
1970	January	93.39	92.04	95.41	9[illegible].[illegible]	[illegible]	[illegible]
	February	93.72	92.15	95.03	9[illegible].[illegible]	[illegible]	[illegible]
	March	94.21	92.63	95.10	9[illegible].[illegible]	[illegible]	[illegible]
	April	94.31	92.79	94.97	9[illegible].[illegible]	[illegible]	[illegible]
	May	94.19	92.57	94.60	9[illegible].[illegible]	[illegible]	[illegible]
	June	94.27	92.28	94.20	9[illegible].[illegible]	[illegible]	[illegible]
	July	93.65	91.95	93.90	9[illegible].[illegible]	[illegible]	[illegible]
	August	92.26	90.67	93.26	9[illegible].[illegible]	[illegible]	[illegible]
	September	91.43	90.17	92.65	9[illegible].[illegible]	[illegible]	[illegible]
	October	91.90	90.49	92.39	9[illegible].[illegible]	[illegible]	[illegible]
	November	91.82	90.62	92.25	9[illegible].[illegible]	[illegible]	[illegible]
	December	91.75	90.69	92.14	9[illegible].[illegible]	[illegible]	[illegible]
1971	January	92.42	91.43	92.21	9[illegible].[illegible]	[illegible]	[illegible]
	February	93.01	92.16	92.53	9[illegible].[illegible]	[illegible]	[illegible]
	March	93.42	92.70	92.77	9[illegible].[illegible]	[illegible]	[illegible]
	April	94.58	93.63	93.03	[illegible]	[illegible]	[illegible]
	May	95.62	94.67	93.42	[illegible]	[illegible]	[illegible]
	June	96.61	95.15	93.73	[illegible]	[illegible]	[illegible]
	July	97.27	95.56	93.93	[illegible]	[illegible]	[illegible]
	August	98.60	96.26	94.21	[illegible]	[illegible]	[illegible]
	September	99.73	96.72	94.[illegible]	[illegible]	[illegible]	[illegible]
	October	99.23	96.72	95.[illegible]	[illegible]	[illegible]	[illegible]
	November	99.28	96.69	95.64	[illegible]	[illegible]	[illegible]
	December	99.18	96.49	95.[illegible]	[illegible]	[illegible]	[illegible]

TABLE 10 -- Continued.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
		percent					
1972	January	99.42	96.70	96.34	94.03	94.78	94.74
	February	100.42	97.61	96.43	93.80	94.82	93.80
	March	101.05	98.14	97.06	93.21	94.54	94.50
	April	100.27	97.40	97.39	93.04	97.70	97.05
	May	99.16	96.16	97.22	91.05	93.95	90.50
	June	98.20	96.20	96.87	90.55	100.89	99.49
	July	96.84	94.06	96.17	90.05	101.40	100.06
	August	97.23	94.84	95.89	90.73	99.05	97.88
	September	98.31	95.54	96.29	90.01	98.20	96.67
	October	100.39	96.71	97.51	89.89	99.18	97.09
	November	102.00	97.91	98.94	89.23	101.24	99.00
	December	103.46	99.59	100.13	92.41	102.11	99.97
1973	January	106.31	101.67	101.54	89.83	101.24	99.00
	February	109.48	104.43	103.22	88.79	100.40	97.95
	March	112.51	106.87	104.77	88.28	99.39	96.94
	April	117.55	110.66	107.02	90.83	97.99	94.65
	May	119.23	112.02	109.07	80.47	101.58	97.53
	June	119.13	112.13	109.81	83.68	103.63	100.07
	July	117.93	111.41	109.31	85.11	105.59	102.27
	August	115.97	110.47	109.32	92.80	106.27	104.01
	September	116.50	110.78	109.54	93.05	106.30	103.64
	October	116.08	111.07	110.17	101.77	107.37	105.85
	November	114.18	109.80	110.14	106.30	110.53	109.88
	December	111.93	108.39	109.60	111.85	112.71	112.54
1974	January	108.14	106.04	108.35	121.90	114.22	115.93
	February	105.73	104.44	106.87	126.00	113.21	115.67
	March	105.84	104.79	106.42	128.04	110.45	114.23
	April	107.31	105.74	106.49	125.56	108.55	112.22
	May	107.33	105.21	106.43	120.95	109.50	112.12
	June	105.09	103.40	105.38	122.87	110.11	113.36
	July	102.88	101.20	103.64	118.85	109.76	112.51
	August	101.71	99.95	102.41	117.43	108.50	110.81
	September	100.50	98.75	101.75	116.65	109.45	110.92
	October	98.67	96.84	100.73	115.24	110.40	110.97
	November	97.85	95.86	99.76	113.29	109.49	110.40
	December	97.19	95.13	98.92	111.68	108.30	109.29
1975[a]	January	97.66	95.78	98.82	114.50	106.76	108.32
	February	100.43	98.39	99.72	116.00	103.49	105.80
	March	102.53	100.40	101.05	117.28	102.73	105.89
	April	103.95	101.95	102.11	121.32	102.82	106.81
	May	106.17	104.13	103.10	124.90	100.66	105.85

[a] -- The first 5 months of 1954 and the last 4 months of 1975 were lost in the process of computing 9-month centered moving average.

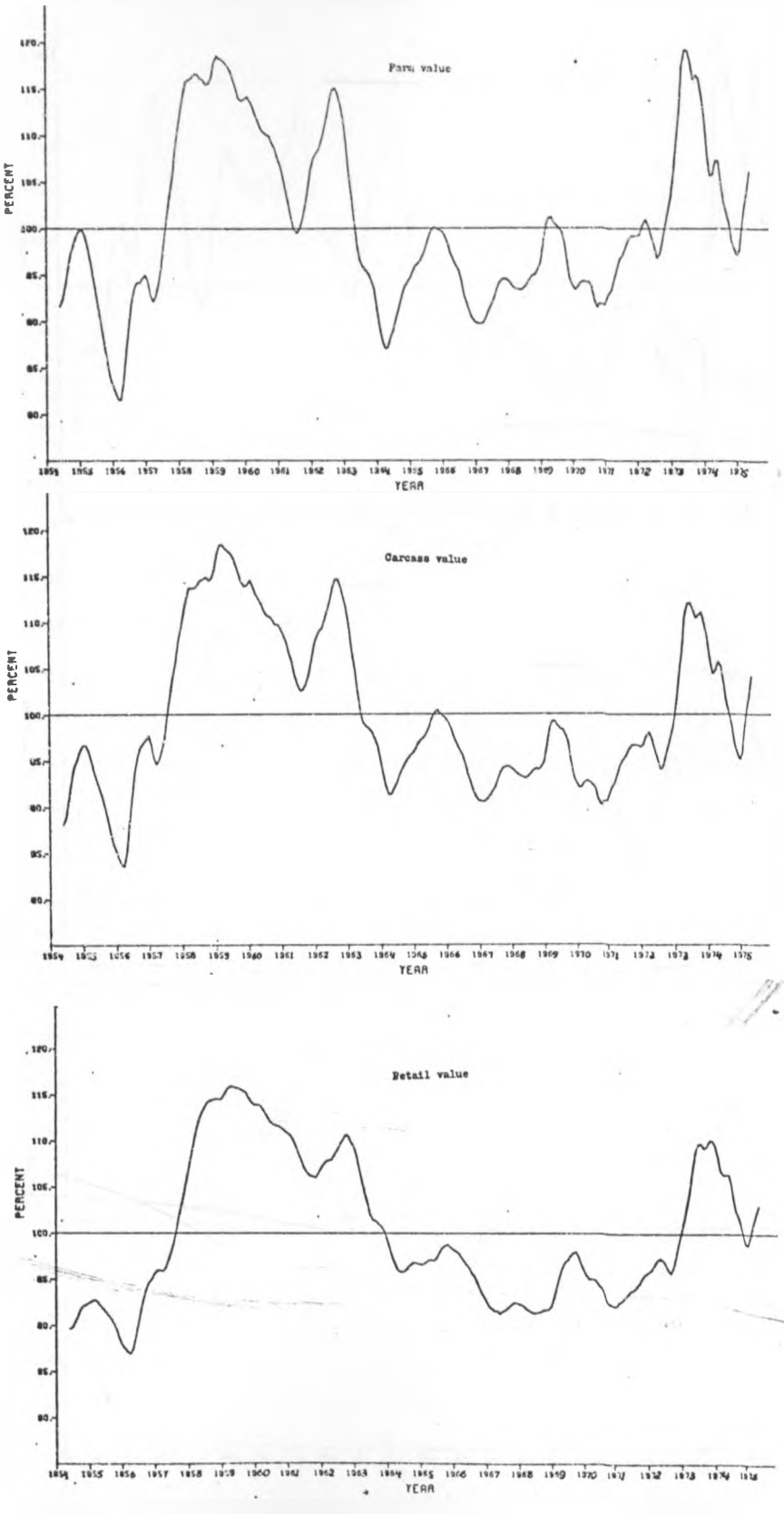

Figure 5. Cyclical fluctuations in farm, carcass and retail values for choice grade beef, U.S., 1954 - September 1975.

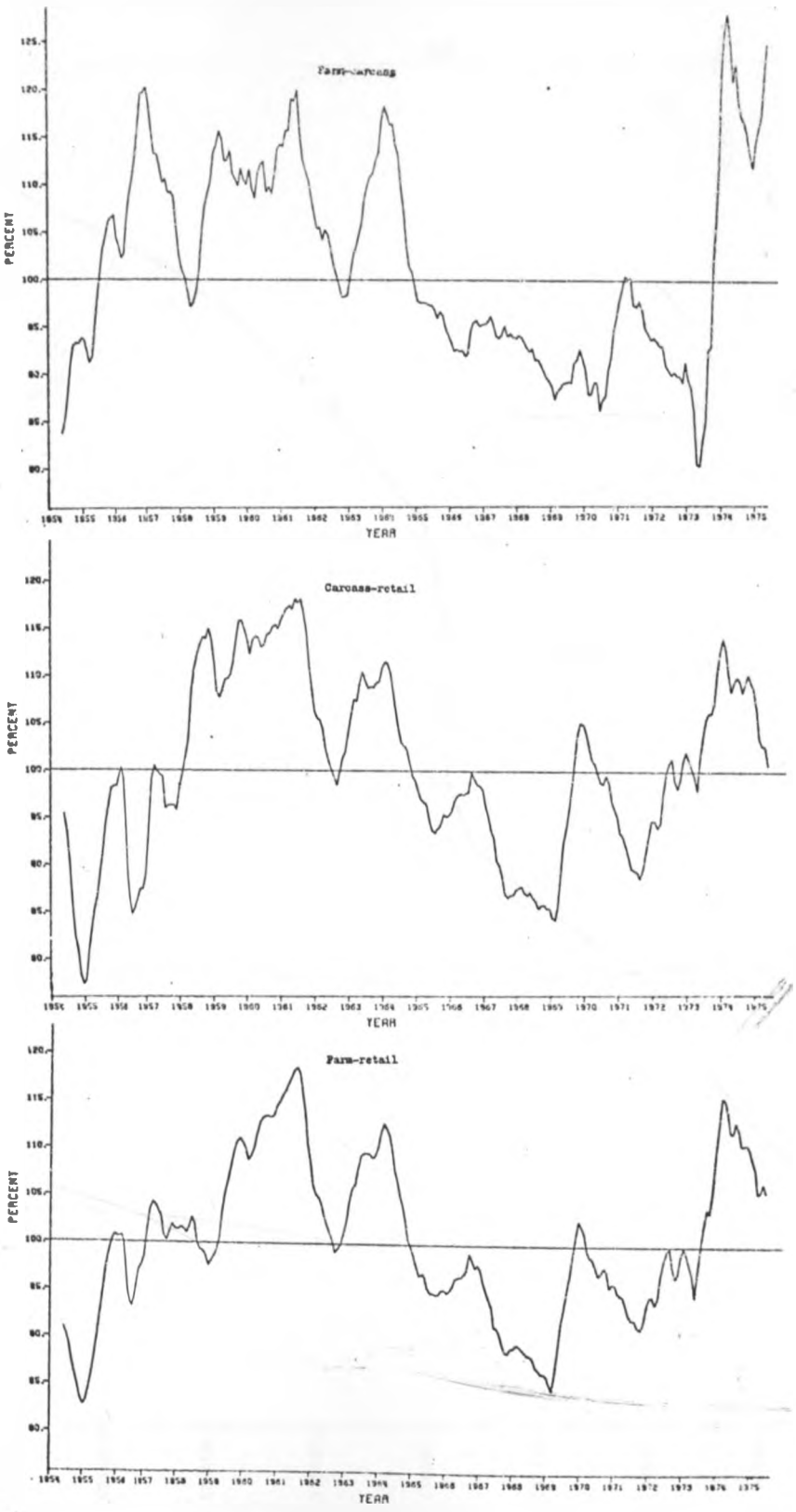

Figure 6. Cyclical fluctuations in farm-carcass, carcass-retail, and farm-retail price spreads for choice [illegible] beef, U.S., 1954 - September 1975.

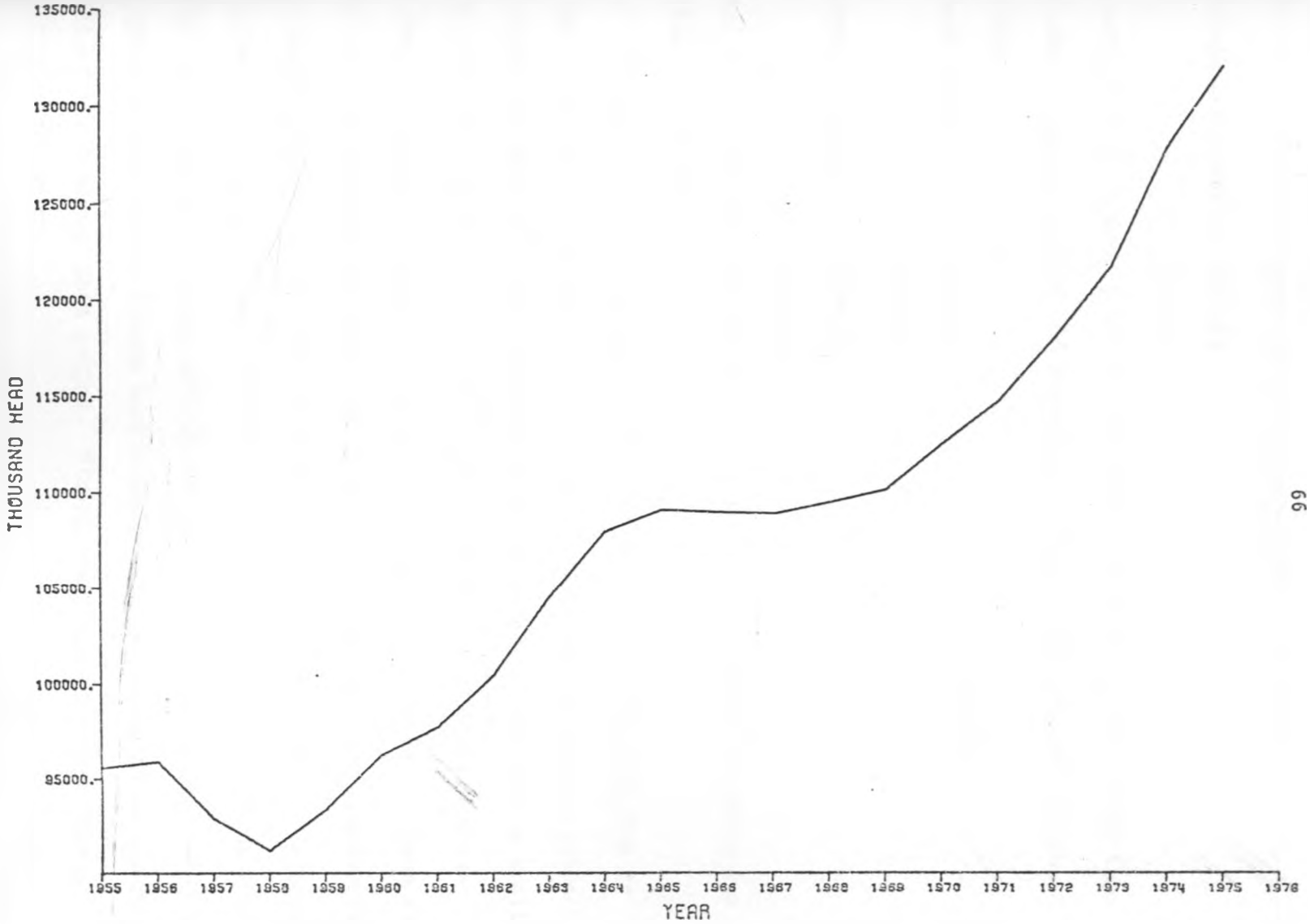

Figure 7. Number of cattle and calves on U.S. farms, 1955-1975.

Liquidation phases-- 1955-57

1965-66

1975-(still in progress)

Accumulation phases-- 1958-64

1967-74

In reference to Figures 5 and 6, the 1955-75 period may be divided into periods of general upward and downward cyclical trend in beef values as follows:

Upward trend-- 1955-58

1965-73

Downward trend-- 1959-64

1974-75

Thus, the period 1955-75 was covered by two cattle cycles and hence two cycles in beef values.

Cattle cycles are caused by the time lag between the decision to change production levels and the change in the number of animals actually reaching the market.[1] For instance, when cattle prices are low, a smaller calf crop is planned; and when the smaller number of slaughter cattle reaches the market, prices increase. With higher prices, an increase in the calf crop is planned; and when the higher supply of slaughter cattle reaches the market prices decline, and so forth. A minor exception to this general inverse relationship between prices and cattle inventory occured during 1965-73. Liquidation during 1965-66 was slight, and then accumulation began in 1967. Cattle prices (hence beef values) were generally on an upward cyclical trend during that period. Strong continuing consumer demand

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[1] U.S., Department of Agriculture, Economic Research Service, "Price Spreads for Beef and Pork, Revised Series, 1949-69," May 1970, p. 6.

coupled with inflation as has been discussed in Chapter III kept prices up.

Cyclical Fluctuations in Beef Price Spreads and their causes

Cyclical fluctuations in beef price spreads (Figure 6) generally directly followed cyclical fluctuations in beef values discussed above. However, cyclical fluctuations in the spreads showed greater variability by larger amplitudes and more short up-and-down movements between years than did those for the values. The stronger seasonal variability in price spreads as explained in Chapter IV did influence these cyclical changes.[1] The fact that cyclical trends in price spreads were upward with upward trends in beef values and downward with downward trends in beef values indicates that on a cyclical basis, beef retail prices rose and fell faster than wholesale prices and in turn, wholesale prices rose and fell faster than live animal or farm prices.

A knowledge of cyclical movements in the beef industry can be particularly helpful to cattle producers and potential cattle producers in making their long-term investment plans, in order to take advantage of periodic rising prices. A beginner in cattle production would be enabled to lay a stronger foundation by entering into business at the start of an upward cyclical swing in prices rather than on the downward swing.

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[1] A strong seasonal component could still affect the cyclical factor despite the fact that these two were isolated, due to the interdependency among the factors and the inherent incompleteness of the decomposition process as was explained in Chapter II.

CHAPTER VI

IRREGULAR MOVEMENTS IN BEEF PRICE SPREADS

Irregular movements in beef price spreads and values are presented in Table 11 and Figures 8 and 9 below. Table 11 shows the computed monthly percentages[1] of the irregular components. Figure 8 and Figure 9 respectively show graphs of the irregular components in beef values and price spreads.

As indicated earlier in Chapter II, irregular movements are caused by random or sporadic factors. The movements are non-recurring and, therefore, have no uniformity or predicability. In beef industry irregular movements can be caused by such factors as adverse weather changes which cause considerable changes in the availability of feed and hence the supply and prices of cattle marketings, a withholding of cattle from the market by producers, government regulation such as a price ceiling, adverse consumer reaction such as beef boycotts, labor strikes, erratic and sudden changes in export demand, etc.

Irregular Movements in Beef Price Spreads and Values

Percentage changes of irregular movements in beef values above or below their average (Figure 8) were about equal for farm and carcass values, and mostly ranged between plus and minus 10 percent, and were less in retail value, ranging between plus and minus 5 percent. This indicates that

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[1] Irregular percentages are percentages of the $T_i \times S_i \times C_i$ product. See Chapter II, p. 22.

TABLE 11.-- Irregular percentages for farm, carcass, and retail values, and farm-carcass, carcass-retail, and farm-retail price spreads for [illegible] grade beef, U.S., January 1954 - September 197[illegible].
(percent of T, X S, X C, product)

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
		percent					
1954[a]	May	100.72	102.14	100.64	107.18	95.39	100.97
	June	98.52	98.85	101.20	97.39	113.87	105.70
	July	95.71	98.10	99.96	110.95	100.56	107.51
	August	95.46	96.51	97.95	101.57	102.58	102.89
	September	99.62	100.62	98.54	110.72	89.74	97.67
	October	101.77	101.59	100.58	104.05	95.07	98.14
	November	103.33	105.98	102.06	105.16	95.92	97.79
	December	106.50	104.85	101.38	94.91	92.97	93.14
1955	January	105.65	104.34	102.25	95.72	87.42	91.01
	February	101.62	100.39	100.78	100.00	95.07	95.58
	March	102.35	100.62	99.52	90.20	98.78	96.93
	April	98.85	100.89	100.13	111.49	93.08	101.60
	May	98.71	97.02	98.82	95.27	105.79	103.87
	June	97.04	96.97	99.74	93.18	114.59	104.27
	July	97.35	95.75	99.33	86.50	108.70	101.96
	August	99.21	99.03	99.45	98.22	100.18	100.18
	September	104.03	105.21	100.57	114.85	85.54	96.69
	October	105.19	105.41	102.67	109.78	95.96	98.81
	November	100.78	102.86	101.71	108.28	98.14	101.05
	December	99.16	98.93	100.90	97.62	111.14	105.70
1956	January	97.63	100.35	100.21	109.14	98.99	102.11
	February	91.24	92.08	97.36	101.58	108.71	104.69
	March	93.79	93.25	95.38	92.86	104.96	102.64
	April	95.58	94.13	96.38	86.91	102.93	97.31
	May	94.95	91.99	97.62	75.53	117.20	102.88
	June	94.16	96.12	97.56	102.61	106.24	102.81
	July	96.35	96.41	97.73	95.54	96.18	98.88
	August	109.64	109.40	100.87	106.29	66.07	82.96
	September	116.43	115.75	105.40	117.19	66.86	86.69
	October	114.17	113.66	107.39	114.94	84.89	95.66
	November	103.01	105.08	104.34	99.66	109.55	104.92
	December	94.56	94.80	99.75	95.82	123.00	111.83
1957	January	90.77	92.79	97.31	99.60	112.72	106.88
	February	88.19	88.93	96.22	98.30	115.36	107.74
	March	96.15	96.51	94.58	99.40	91.37	95.61
	April	99.65	99.36	98.63	97.37	95.46	96.23
	May	101.67	100.63	100.62	92.70	100.55	99.37
	June	99.92	100.34	100.62	99.73	105.24	101.10
	July	102.79	103.27	101.93	105.12	91.29	98.86
	August	102.39	103.26	101.55	109.49	93.76	99.71
	September	98.50	97.50	100.08	95.29	110.02	103.77
	October	97.20	96.25	98.97	93.72	108.15	100.41
	November	97.70	99.99	97.19	111.14	87.97	92.21
	December	100.43	100.58	97.79	96.92	95.87	93.53
1958	January	100.45	101.56	100.82	110.23	95.67	105.85
	February	99.70	98.41	99.36	98.73	98.94	109.29
	March	105.82	102.98	100.92	81.56	95.73	98.27
	April	104.02	102.88	102.89	91.41	101.90	97.81
	May	104.20	105.32	102.33	110.19	93.78	99.36
	June	101.44	101.58	102.27	97.23	108.27	101.06
	July	99.43	98.61	101.60	89.82	105.71	98.83
	August	92.62	93.31	98.39	96.43	114.38	99.74
	September	96.86	96.16	97.27	94.67	102.10	104.77
	October	101.24	100.68	99.33	112.09	94.90	102.80
	November	98.94	100.83	99.76	107.25	95.33	94.79
	December	101.50	102.15	99.61	105.25	96.00	95.62
1959	January	101.35	101.20	101.30	98.52	100.39	99.07
	February	98.26	98.16	100.66	103.98	103.83	97.75
	March	100.83	99.84	99.72	92.86	102.76	94.05
	April	102.55	103.14	100.20	104.98	89.62	99.07
	May	104.32	103.70	101.24	95.76	93.49	98.87
	June	101.03	101.61	100.62	101.85	101.07	102.66
	July	97.78	98.68	100.54	105.56	102.95	104.05
	August	97.44	96.27	98.75	87.63	106.44	103.74
	September	100.14	100.66	98.34	109.73	92.86	99.59
	October	101.29	101.75	100.64	103.90	97.14	99.02
	November	98.80	98.31	101.14	88.75	102.44	99.21
	December	97.25	96.61	100.30	92.51	114.12	97.93
1960	January	99.67	99.13	100.29	99.73	[illegible]	103.67
	February	99.97	99.35	98.07	113.76	91.99	[illegible]
	March	103.25	102.94	98.66	96.13	[illegible]	95.03
	April	103.27	103.77	101.11	100.15	93.14	[illegible]
	May	102.72	104.18	101.42	99.41	[illegible]	[illegible]
	June	100.35	[illegible]	100.74	[illegible]	107.50	[illegible]
	July	[illegible]	[illegible]	99.99	102.72	101.97	102.14
	August	[illegible]	97.51	[illegible]	[illegible]	[illegible]	[illegible]
	September	[illegible]	99.47	97.35	101.77	[illegible]	[illegible]
	October	[illegible]	97.74	99.19	[illegible]	[illegible]	[illegible]
	November	[illegible]	[illegible]	99.12	[illegible]	[illegible]	[illegible]
	December	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 11.--Continued.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
		Percent					
1961	January	102.07	[illegible]	102.71	92.05	[illegible]	92.77
	February	103.45	103.61	101.60	[illegible]	[illegible]	[illegible]
	March	101.52	102.50	101.01	[illegible]	100.17	[illegible]
	April	99.04	99.16	101.07	[illegible]	[illegible]	[illegible]
	May	95.73	96.88	100.61	[illegible]	[illegible]	[illegible]
	June	93.59	95.71	98.30	[illegible]	[illegible]	[illegible]
	July	92.11	93.33	97.22	99.80	[illegible]	104.39
	August	96.63	96.49	97.44	110.13	94.37	[illegible]
	September	99.10	98.19	98.14	[illegible]	99.15	93.40
	October	100.37	100.89	100.50	104.52	97.93	93.47
	November	102.00	99.99	100.92	[illegible]	[illegible]	[illegible]
	December	103.44	102.48	100.47	95.34	[illegible]	[illegible]
1962	January	102.23	101.80	101.17	99.12	99.11	[illegible]
	February	101.25	100.69	100.03	105.04	93.58	95.97
	March	102.25	102.65	100.86	105.18	98.82	102.71
	April	101.15	100.94	100.61	95.54	[illegible]	93.53
	May	97.32	98.53	99.52	104.27	102.55	103.34
	June	93.53	95.35	98.60	106.18	111.66	[illegible]
	July	93.93	94.76	97.57	100.37	100.99	[illegible]
	August	99.10	99.05	98.05	97.68	[illegible]	95.12
	September	105.89	104.60	101.43	99.13	93.78	95.18
	October	106.95	105.13	102.43	93.29	94.95	94.85
	November	109.81	109.04	103.66	95.74	89.06	[illegible]
	December	109.01	108.32	102.81	102.47	92.14	[illegible]
1963	January	102.93	101.31	105.25	[illegible]	[illegible]	[illegible]
	February	95.65	94.97	99.48	95.37	[illegible]	[illegible]
	March	90.43	92.36	96.29	107.19	[illegible]	[illegible]
	April	93.33	94.37	97.98	98.74	107.67	[illegible]
	May	92.85	95.62	96.55	111.33	99.40	[illegible]
	June	95.93	97.72	97.32	106.28	[illegible]	[illegible]
	July	104.60	102.96	99.50	90.59	[illegible]	[illegible]
	August	103.52	102.47	101.11	94.92	[illegible]	[illegible]
	September	103.29	102.48	101.02	101.54	93.81	[illegible]
	October	104.73	103.72	101.92	[illegible]	[illegible]	97.79
	November	101.86	101.93	101.90	97.42	100.12	[illegible]
	December	98.78	99.25	101.17	101.95	[illegible]	[illegible]
1964	January	101.38	99.86	100.92	89.98	[illegible]	[illegible]
	February	95.86	97.04	99.88	110.76	[illegible]	[illegible]
	March	97.40	98.40	98.06	105.63	[illegible]	[illegible]
	April	93.50	96.22	97.28	111.15	[illegible]	[illegible]
	May	90.92	93.37	97.37	104.78	[illegible]	[illegible]
	June	96.35	96.51	97.13	93.77	[illegible]	[illegible]
	July	100.47	99.77	99.27	93.75	[illegible]	[illegible]
	August	105.33	105.18	100.47	103.90	[illegible]	[illegible]
	September	107.88	105.77	102.67	95.55	[illegible]	[illegible]
	October	104.65	103.13	102.56	[illegible]	[illegible]	[illegible]
	November	101.91	102.13	102.75	93.37	[illegible]	[illegible]
	December	99.51	99.90	101.60	103.31	[illegible]	[illegible]
1965	January	96.87	96.73	99.25	96.65	[illegible]	[illegible]
	February	93.14	93.21	96.91	102.16	[illegible]	[illegible]
	March	94.64	95.60	94.96	[illegible]	[illegible]	[illegible]
	April	97.99	97.80	97.47	92.33	[illegible]	[illegible]
	May	105.17	105.03	100.00	[illegible]	[illegible]	[illegible]
	June	107.99	107.61	103.72	[illegible]	[illegible]	[illegible]
	July	101.56	101.58	103.82	[illegible]	[illegible]	[illegible]
	August	99.41	99.77	101.42	[illegible]	[illegible]	[illegible]
	September	99.09	99.09	98.70	[illegible]	[illegible]	[illegible]
	October	99.94	97.29	99.36	[illegible]	[illegible]	[illegible]
	November	97.91	98.85	100.17	[illegible]	[illegible]	[illegible]
	December	99.56	99.27	99.23	[illegible]	[illegible]	[illegible]
1966	January	93.41	98.70	98.87	[illegible]	[illegible]	[illegible]
	February	101.91	[illegible]	100.52	[illegible]	[illegible]	[illegible]
	March	107.60	[illegible]	101.00	[illegible]	[illegible]	[illegible]
	April	[illegible]	101.92	102.19	[illegible]	[illegible]	[illegible]
	May	[illegible]	100.03	101.80	[illegible]	[illegible]	[illegible]
	June	96.71	[illegible]	99.01	[illegible]	[illegible]	[illegible]
	July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	December	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

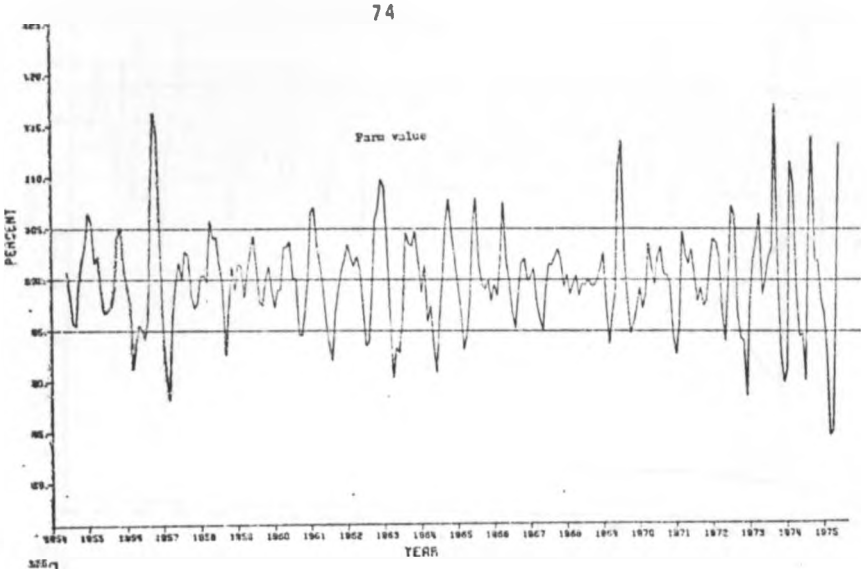
TABLE 11.— Continued.

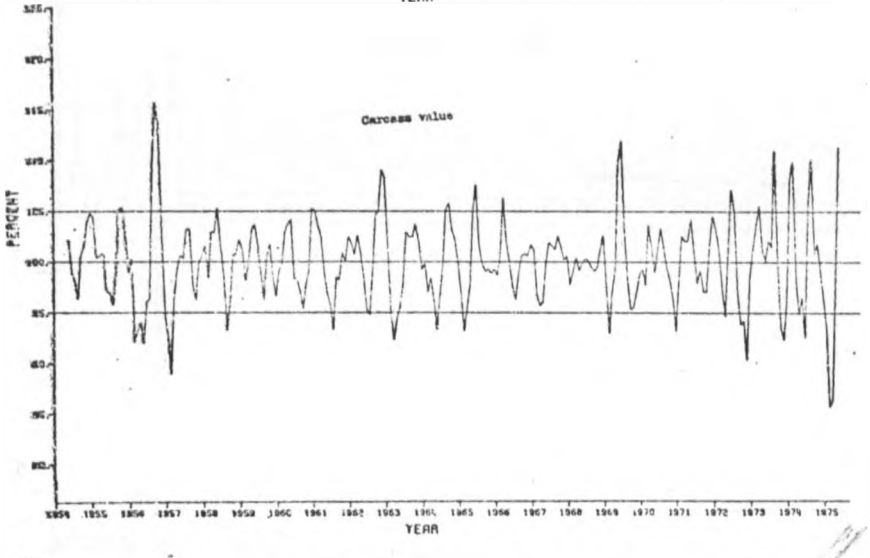
Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
		percent					
1967	January	101.09	101.19	99.82	102.69	97.66	95.75
	February	97.79	96.74	99.50	97.93	102.56	99.67
	March	96.19	95.69	98.69	90.66	108.96	107.80
	April	94.95	96.10	98.21	102.27	103.05	103.39
	May	99.19	99.78	97.63	100.91	91.35	95.23
	June	101.54	101.95	99.61	101.14	96.61	95.68
	July	101.41	101.61	100.64	101.92	95.60	97.75
	August	102.21	101.22	100.46	92.01	99.16	97.11
	September	103.02	102.55	100.93	104.02	98.70	99.30
	October	101.89	101.43	101.80	101.56	102.70	102.10
	November	99.29	100.20	100.31	102.15	100.34	100.29
	December	100.47	100.61	100.59	102.59	97.45	103.38
1968	January	98.59	97.75	99.68	92.44	106.25	99.27
	February	99.61	99.07	99.49	103.77	97.25	96.61
	March	100.42	100.39	99.42	98.64	100.64	102.06
	April	98.43	99.20	99.59	101.47	100.92	100.96
	May	99.53	99.80	100.09	97.85	100.57	101.40
	June	99.47	100.32	99.45	103.57	100.35	98.45
	July	100.07	100.16	100.38	99.81	96.36	99.48
	August	99.46	99.47	99.48	98.68	96.46	99.40
	September	99.41	99.13	99.80	102.17	102.86	102.77
	October	99.97	99.46	100.35	99.00	101.77	101.53
	November	101.05	101.23	100.25	96.92	96.77	97.02
	December	102.52	102.65	99.46	103.84	94.47	98.24
1969	January	97.35	97.41	99.76	100.27	106.76	102.07
	February	93.72	93.01	97.19	96.20	105.02	101.62
	March	96.53	97.22	96.43	102.13	97.32	100.17
	April	98.75	99.27	98.00	99.09	93.78	95.34
	May	110.78	109.77	102.15	98.08	81.69	85.76
	June	113.60	111.94	105.51	91.01	91.80	89.40
	July	102.24	102.96	104.97	108.86	105.53	108.91
	August	97.98	98.28	102.49	100.36	113.52	111.24
	September	94.81	95.38	99.20	106.73	109.33	109.06
	October	95.75	95.56	97.10	98.24	100.91	99.46
	November	97.03	97.03	98.80	91.36	100.39	99.34
	December	99.21	98.87	99.03	96.96	101.54	100.77
1970	January	97.24	99.32	100.34	118.49	103.83	103.20
	February	93.57	97.75	99.12	100.53	98.72	97.63
	March	103.52	103.67	100.20	102.80	95.16	98.37
	April	101.17	101.38	100.76	9..33	98.94	99.47
	May	99.56	98.99	100.71	90.29	104.18	103.10
	June	102.27	101.23	99.56	85.34	98.56	93.94
	July	103.23	103.32	101.55	103.13	93.46	97.50
	August	100.51	101.41	101.16	109.21	101.23	102.71
	September	100.46	99.35	98.98	96.93	99.44	96.65
	October	99.59	96.06	99.77	88.83	102.48	100.30
	November	94.53	96.15	99.14	104.35	104.20	104.42
	December	92.77	93.21	97.21	97.49	109.87	106.75
1971	January	95.76	97.91	97.93	115.39	99.78	99.50
	February	104.78	102.57	100.19	93.99	91.44	89.92
	March	102.45	102.05	99.90	97.79	98.42	100.00
	April	101.51	102.09	101.27	103.08	92.50	100.02
	May	103.31	104.24	101.68	110.72	95.52	99.67
	June	100.50	101.02	101.48	101.30	105.73	107.24
	July	97.92	97.94	99.79	96.95	100.90	101.52
	August	99.25	99.20	99.57	99.14	101.72	100.42
	September	97.43	97.07	98.31	96.77	102.82	102.91
	October	98.16	97.06	98.24	9..05	100.27	98.82
	November	101.48	101.01	98.44	96.75	89.61	91.14
	December	104.00	104.56	99.26	110.54	89.27	92.16
1972	January	103.64	103.11	101.52	100.69	99.03	98.13
	February	102.32	101.17	103.91	100.65	102.80	103.69
	March	96.74	97.22	102.21	99.60	116.27	117.54
	April	94.04	94.69	98.42	95.67	107.42	103.75
	May	100.28	101.30	98.10	107.66	94.14	94.70
	June	107.29	107.18	99.63	101.75	84.67	85.49
	July	106.24	104.83	102.12	91.17	94.93	96.45
	August	96.69	97.04	101.91	106.42	1..0.5	108.96
	September	94.91	95.87	97.14	95.25	100.70	102.78
	October	94.52	94.23	97.19	1..0.20	103.14	105.68
	November	88.69	90.46	94.91	10..96	103.7.	107.42
	December	97.72	96.53	94.76	104.44	98.8.	94.89

TABLE 11.-- Continued.

Year	Month	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
		percent					
1973	January	102.03	101.28	99.64	96.16	96.06	92.63
	February	103.78	103.33	103.09	109.17	94.52	99.09
	March	106.50	105.59	104.41	100.20	104.59	106.35
	April	90.63	101.21	102.65	115.87	106.23	110.73
	May	100.30	100.05	100.73	91.50	102.45	102.07
	June	102.15	102.10	99.01	95.18	93.90	91.62
	July	105.15	101.48	99.02	79.56	83.28	88.90
	August	117.13	111.02	104.40	81.87	86.94	78.79
	September	99.95	99.46	103.51	101.01	115.76	113.28
	October	92.64	93.61	97.85	107.31	107.73	103.29
	November	90.03	92.36	98.62	108.31	105.45	106.31
	December	91.34	95.27	95.79	139.92	97.62	105.53
1974	January	111.62	108.30	103.17	85.15	91.42	87.16
	February	109.55	109.84	108.13	120.79	100.44	103.23
	March	98.77	98.31	101.90	93.57	113.81	111.93
	April	94.54	94.89	97.57	94.37	104.00	102.35
	May	94.76	96.52	98.65	106.11	96.77	100.28
	June	90.23	92.60	94.95	106.52	103.50	101.55
	July	105.43	105.85	100.11	107.92	82.70	90.34
	August	114.10	110.09	104.52	79.20	91.72	89.12
	September	101.89	100.79	102.70	97.91	108.30	106.24
	October	101.90	101.77	101.52	104.38	99.61	101.10
	November	98.06	98.93	100.22	100.92	100.97	101.28
	December	96.07	96.47	98.44	95.56	105.10	103.08
1975[a]	January	92.74	93.51	99.06	98.93	113.70	106.97
	February	84.30	85.77	93.97	99.73	110.71	105.68
	March	85.31	86.50	90.37	95.72	102.93	103.82
	April	98.60	98.63	94.20	95.87	82.27	85.83
	May	113.33	111.34	103.01	93.23	80.64	85.05

[a] -- The first 5 months of 1954 and the last 4 months in 1975 were lost in the process of computing 9-month centered moving average for the cyclical percentages.





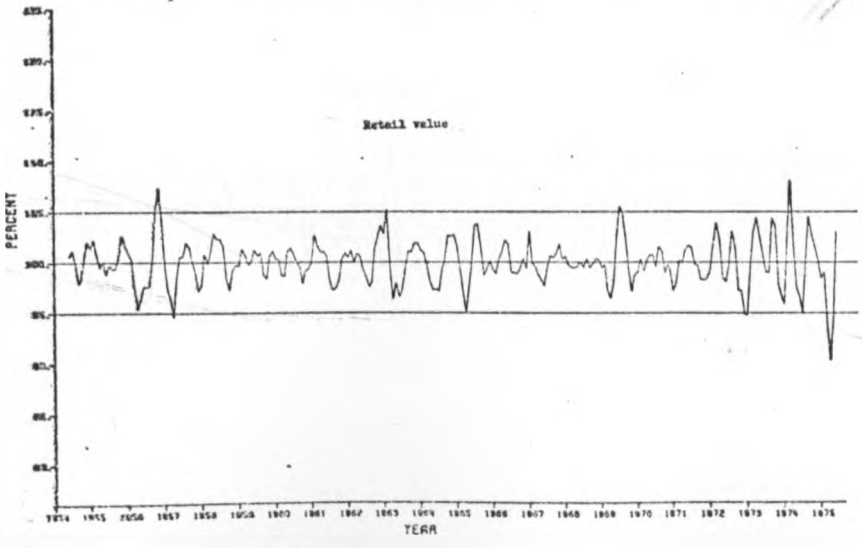


Figure 8. Irregular movements in farm, carcass, and retail values for choice grade beef, U.S., 1954 - September 1975.

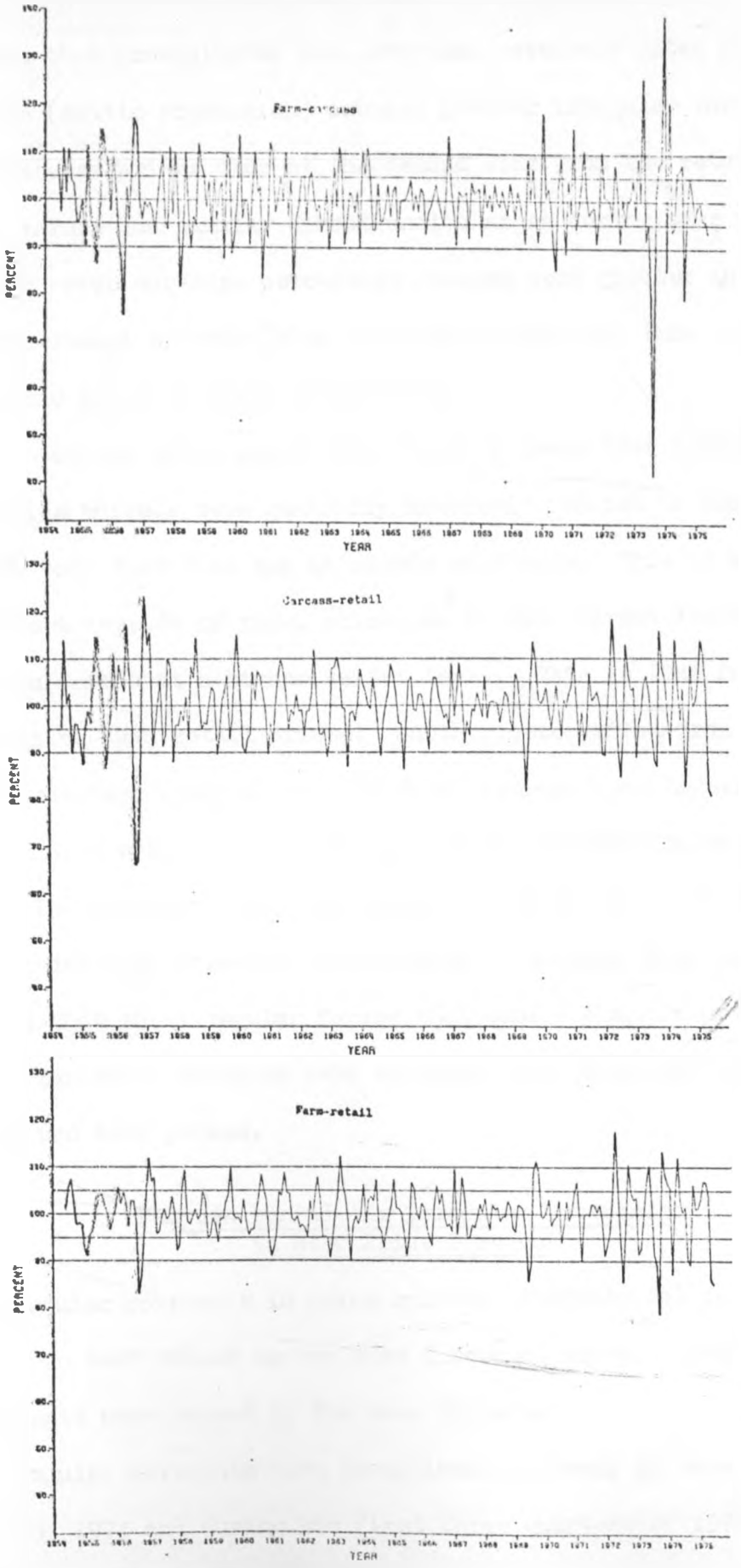


Figure 9. Irregular components in farm-carcass, carcass-retail, and farm-retail price spreads for choice beef, U.S., 1954 - September 1975.

the factors that precipitated the irregular movements often struck at the supply side (cattle production) causing greater irregular variations in farm and carcass prices than at the demand side from the retail end. All the three values had similar directional changes during same periods.

Among price spreads, percentage changes were greater in farm-carcass and carcass-retail spreads (plus or minus 15 percent) than in the farm-retail spread (plus or minus 10 percent).

A comparison of Figure 8 with Figure 9 shows that irregular movements in beef price spreads were generally inversely related to those in beef values, in both direction and magnitude of change. This is an indication that in short periods of time, prices at a lower market level rose or fell faster than prices at a higher market level. This is that farm prices rose or fell faster than retail prices. Another observation from the comparison is that percentage changes above or below average were higher in price spreads than in values. While changes in the spreads ranged between plus and minus 15 percent, changes in values ranged between plus and minus 10 percent, indicating stronger irregularity in spreads than in the values. This means that the irregular forces that caused changes in the costs of providing marketing services were stronger than those that caused changes in cattle and beef prices.

Factors behind the Irregular Movements in Beef Price Spreads

Irregular movements in price spreads inversely followed irregular movements in beef values as has been discussed above. Accordingly, these two movements were caused by the same factors.

Irregular movements were exceptionally strong in some months of 1956, 1969, 1973, 1974 and during the first three quarters of 1975.

According to USDA,[1] an exceptionally large number of steers was carried over from late 1955 and marketed in early 1956. The sharp increases in values (and therefore decreases in the spreads) during the third quarter of 1956 reflected reduced supplies of fed cattle compared with 1955. Sharply increased marketings of fed cattle plus heavy marketing of other cattle caused a downward movement in values and therefore an upward movement in spreads in the final quarter of 1956.

As for 1969, USDA[2] reported that a strong continuing consumer demand due to increasing disposable income (and the Vietnamese war) coupled with reduced per capita beef supplies caused retail prices to rise sharply. However, farm and carcass prices declined causing the spreads to widen considerably.

During 1973, "several factors reduced production of fed cattle and pushed prices up to record levels. The rate of weight gain was less than usual because of a severe winter weather, excessively muddy lots in the spring, the ban on feeding diethylstilbesterol (DES), and changes in relative amounts of grain and supplement fed because of rapidly increasing feed costs. In addition, the announcement in July 1973 that beef price ceilings imposed in March 1973 would be lifted in September, accompanied by the jump in hog prices when ceilings were lifted on pork, encouraged cattle feeders to hold back cattle nearing market weights for expected higher prices in September and generally slowed movements through the feedlots....Price spreads were squeezed during the freeze on retail prices,

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[1]U.S., Department of Agriculture, Agricultural Marketing Service, The Marketing and Transportation Situation, MTS-124 (Washington, D.C.: Government Printing Office, January 1957), p. 13.

[2]U.S., Department of Agriculture, Economic Research Service, The Marketing and Transportation Situation, MTS-175 (Washington, D.C.: Government Printing Office, November 1969), pp. 3-9.

particularly in June through August. After the price ceilings were lifted allowing retail prices to rise as processors and retailers passed on increased costs, the spreads widened substantially."[1]

It can thus be said that two factors contributed to abruptly higher price spreads in 1973. "First, there were increases in labor and other costs to packers, processors, and retailers that could not be passed through until price ceilings were lifted. There was a decrease in percentage yield of retail beef cuts from the heavier cattle marketed after August. The wider spreads since Fall 1973 have provided some packers and retailers a chance to recoup earlier operating losses when margins were squeezed."[2]

There were strong irregular fluctuations in price spreads and values in the first quarter of 1974. "The truck strike which was settled in mid-February, contributed much price movement during the quarter. It disrupted both the flow of live cattle to market and the flow of beef from meat packers to retailers. Both the threat of the impeding strike and the actual strike caused serious maladjustments in supplies, and prices jumped as marketing firms bid for the dwindling supplies. Farm values peaked in January, but then trailed off, falling sharply in March. In contrast, the spreads were squeezed sharply in January, but widened significantly in March."[3]

High foreign demand for U.S. feed and food grains pushed prices of these commodities high relative to livestock prices in the later months of 1974 and early 1975. Cattle producers reacted to the high feed prices and

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[1]Ibid., LMTS-193, May 1974, p. 21.

[2]Ibid.

[3]Ibid., p. 4.

unfavorable returns in 1974 by cutting down production of fed cattle and other livestock.[1] As a result, marketings were down (therefore prices up and spreads down) during the first three quarters of 1975.

It is evident from the above account that some unusual events such as price ceilings, adverse weather, labor strikes, unfavorable market forces can cause wild swings in prices and spreads from month or quarter to the next. They are difficult to plan for since they are unpredictable and do not occur with any uniformity. However, cattle producers need to look over past history and develop an awareness that adverse events can and do happen and, therefore, need to arm themselves with sufficient insurance to protect themselves against the risk of adverse effects or of being wiped out of business altogether.

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[1]U.S., Department of Agriculture, Economic Research Service, Agricultural Outlook, AO-5 (Washington, D.C.: Government Printing Office, October 1975), pp. 5-7.

CHAPTER VII

LEAD-LAG RELATIONSHIP BETWEEN LIVE ANIMAL AND RETAIL BEEF PRICES

Results and Analysis

The results of lead-lag relationship between live animal and retail beef prices are presented in Figure 10, Table 12 and Figure 11. Figure 10 shows graphic relationship between the two prices month by month and by year from January 1954-December 1974. Table 12 summarizes the leads and lags, and the magnitudes of changes in these prices for periods of increasing and declining live animal prices. And Figure 11 shows a schematic diagram of these lead-lag relationships.

The following conclusions can be drawn from the above presentation of the Lead-Lag relationship between live animal and retail price movements:

When live animal prices were increasing:

(1) The average beginning lag in retail prices was 24 days.

(2) The average ending lag in retail prices was 15 days.

(3) The live animal prices on average increased 27 percent above the beginning price in an average duration of 9.6 months.

(4) The retail prices on average increased 12 percent above the beginning price in an average duration of 9.3 months.

When live animal prices were decreasing:

(1) The average beginning lag in retail prices was 15 days (same lag as the ending lag in retail prices for increasing live animal prices).

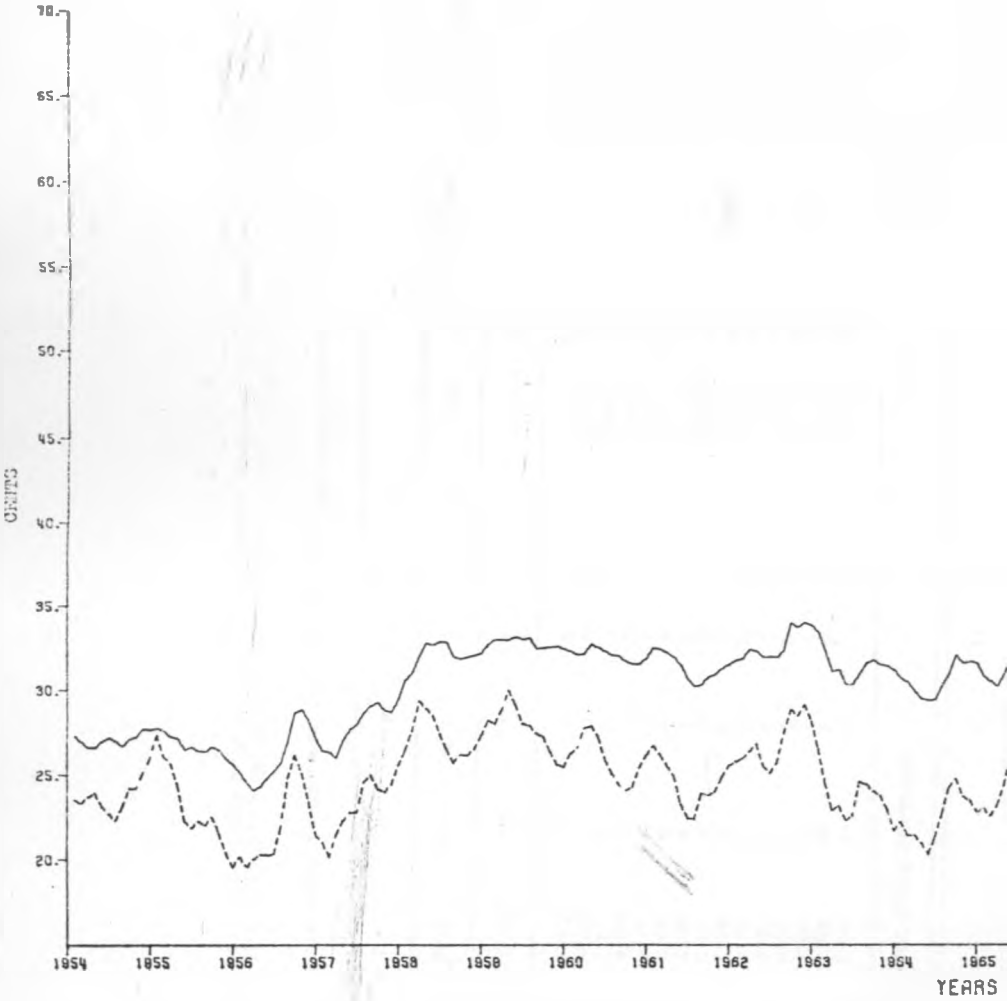


Figure 10. Choice 900 - 1100 lb. slaughter steers, Omaha, price per cwt, and U.S. average retail price of choice grade beef per lb, 1954 - 1974.

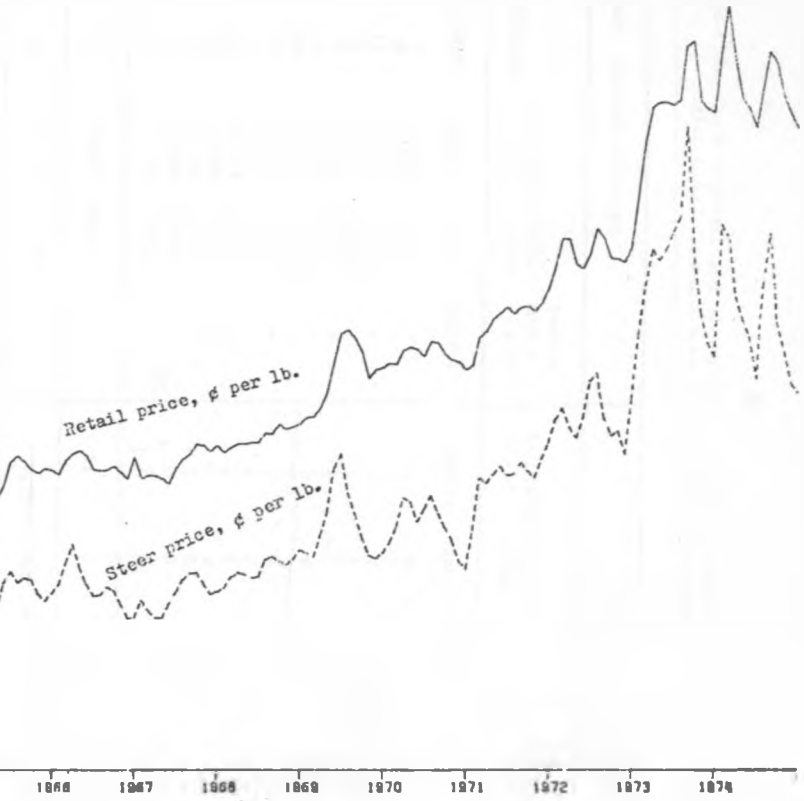

Retail price, ¢ per lb.
Steer price, ¢ per lb.
1966
1967
1968
1969
1970
1971
1972
1973
1974

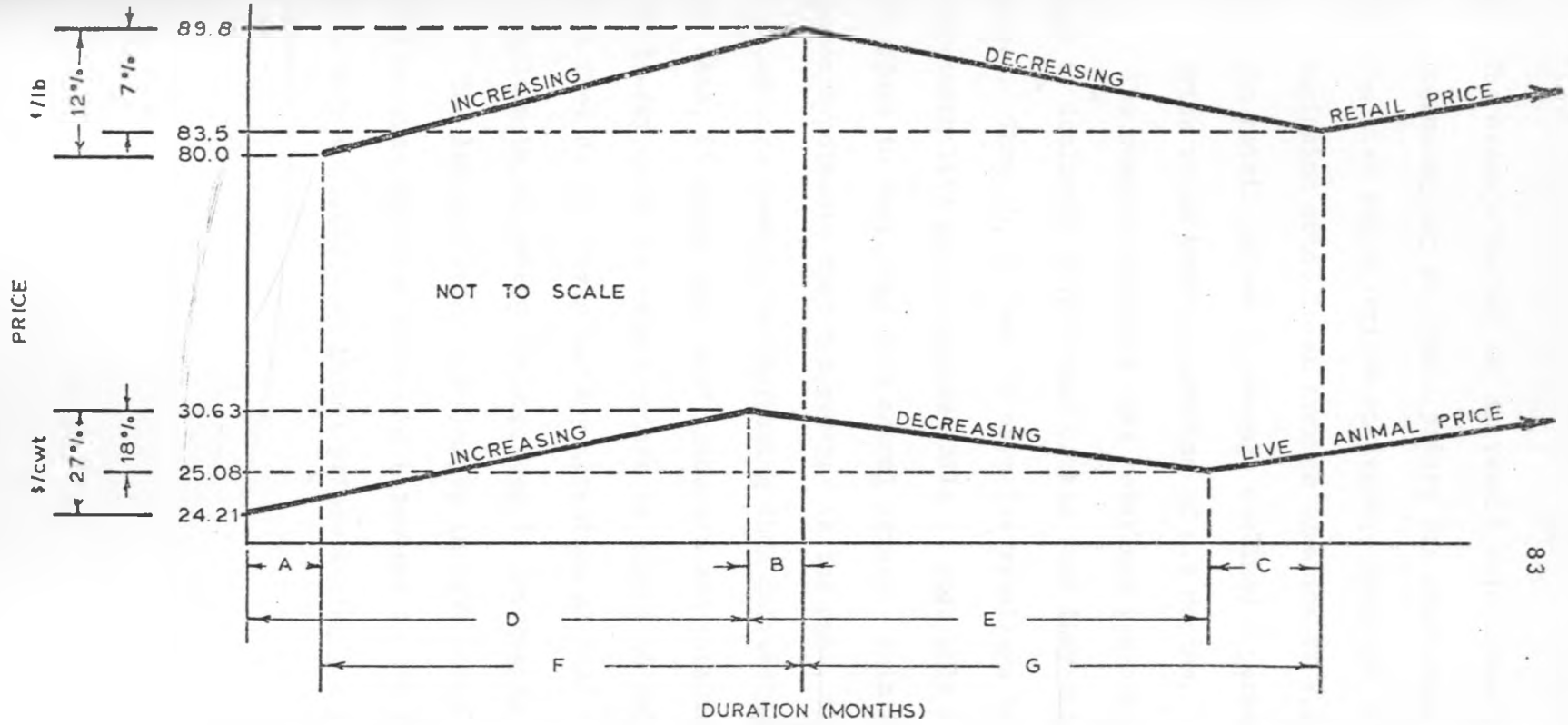
TABLE 12.--Lags in retail beef prices during periods of increasing and decreasing live animal prices, U.S.A., January 1954 - December 1974.

Increasing live Animal Prices						Increasing Retail Prices					
From but excluding	To and including	Duration	Beginning Price	Ending Price	Average change in price	Beginning Lag	Ending Lag	Duration	Beginning Price	Ending Price	Average change in price
		Months	$/cwt	$/cwt	Percent	Months	Months	Months	¢/lb.	¢/lb.	Percent
July '54	- Jan. '55	6	22.28	27.96	-	1	0	5	66.8	69.4	-
Dec. '55	- Sept. '56	9	19.54	26.16	-	3	1	7	60.2	72.2	-
Feb. '57	- Mar. '58	13	20.12	29.31	-	1	1	13	65.0	82.0	-
Aug. '58	- Apr. '59	8	25.68	29.98	-	1	1	8	79.6	82.9	-
Dec. '59	- Apr. '60	4	25.43	27.88	-	2	0	3	80.2	81.6	-
Sept. '60	- Jan. '61	4	24.06	26.74	-	1	0	3	78.8	81.3	-
July '61	- Nov. '62	16	22.34	29.12	-	0	0	16	75.5	85.0	-
May '64	- Sept. '64	4	20.28	24.75	-	0	0	4	73.4	80.1	-
Feb. '65	- June '65	4	22.53	26.69	-	1	1	4	75.5	83.8	-
Nov. '65	- Mar. '66	4	24.93	28.25	-	1	1	3	81.0	84.6	-
Apr. '67	- June '69	26	23.89	33.63	-	1	1	26	79.6	102.4	-
Nov. '69	- July '70	8	27.44	31.12	-	- 1	0	9	95.2	100.7	-
Dec. '70	- July '72	9	26.82	38.38	-	0	0	19	96.5	117.8	-
Nov. '72	- Aug. '73	9	33.39	52.94	-	0	1	10	112.3	144.9	-
Total		134	338.93	432.31	-	11	7	130	1119.6	1268.9	-
Average		9.6	24.21	30.63[a]	27	0.79	0.5	9.3	80.0	89.8[a]	12
Average in days		-	-	-	-	24	15	-	-	-	-

Decreasing live Animal Prices						Decreasing Retail Prices					
Jan. '54	- July '54	6	23.51	22.28	-	-	1	7	68.3	66.8	-
Jan. '55	- Dec. '55	11	27.36	19.54	-	0	3	14	69.4	60.2	-
Sept. '56	- Feb. '57	5	26.16	20.12	-	1	1	5	72.2	65.0	-
Mar. '58	- Aug. '58	5	29.31	25.68	-	1	1	5	82.0	79.6	-
Apr. '59	- Dec. '59	8	29.98	25.43	-	1	2	8	82.9	80.2	-
Apr. '60	- Sept. '60	5	27.88	24.06	-	0	1	6	81.6	78.8	-
Jan. '61	- July '61	6	26.74	22.34	-	0	0	6	81.3	75.5	-
Nov. '62	- May '64	18	29.12	20.28	-	0	0	18	85.0	73.4	-
Sept. '64	- Feb. '65	5	24.75	22.53	-	0	1	6	80.1	75.5	-
June '65	- Nov. '65	5	26.69	24.93	-	1	1	6	83.8	81.0	-
Mar. '66	- Apr. '67	13	28.25	23.89	-	1	1	13	84.6	79.6	-
June '69	- Nov. '69	5	33.63	27.44	-	1	- 1	3	102.4	95.2	-
July '70	- Dec. '70	5	31.12	26.82	-	0	0	5	100.7	96.5	-
July '72	- Nov. '72	4	38.38	33.39	-	0	0	4	117.8	112.3	-
Aug. '73	- Dec. '74	16	52.94	37.20	-	1	-	16	114.9	132.2	-
Total		117	455.82	376.13	-	7	11	122	1333.2	1251.8	-
Average		7.8	30.63[a]	25.08	18	0.5	0.79	8.1	89.8[a]	83.5	7
Average in days		-	-	-	-	15	24	-	-	-	-

[a] — Average of columns of ending and beginning prices for increasing and decreasing prices, respectively. "Ending" and "Beginning" months are the same.

Source: Computed from Omaha Choice 900 - 1100 lb. Slaughters, Omaha monthly price per cwt, January 1954 - December 1974 given in Appendix C , and from U.S. composite monthly retail price per pound January 1954 - December 1974 given in Appendix A .



A = 24 DAYS = AVERAGE BEGINNING LAG FOR INCREASING PRICES.
B = 15 DAYS = AVERAGE ENDING LAG FOR INCREASING PRICES AND AVERAGE BEGINNING LAG FOR DECREASING PRICES.
C = 24 DAYS = AVERAGE ENDING LAG FOR DECREASING PRICES, WHICH IS EQUAL TO AVERAGE BEGINNING LAG FOR INCREASING PRICES.
D = 9.6 MONTHS = AVERAGE DURATION FOR INCREASING LIVE ANIMAL PRICES.
E = 7.8 MONTHS = AVERAGE DURATION FOR DECREASING LIVE ANIMAL PRICES.
F = 9.3 MONTHS = AVERAGE DURATION FOR INCREASING RETAIL PRICES.
G = 8.1 MONTHS = AVERAGE DURATION FOR DECREASING RETAIL PRICES.

SOURCE: DRAWN FROM INFORMATION IN TABLE 12.

FIGURE 11 -- SCHEMATIC DIAGRAM OF THE LEAD-LAG RELATIONSHIP BETWEEN LIVE ANIMAL AND RETAIL BEEF PRICES, DURING PERIODS OF INCREASING AND DECREASING LIVE ANIMAL PRICES, U.S., JANUARY 1954-SEPTEMBER 1975.

(2) The average ending lag in retail prices was 24 days (same as the beginning lag in retail prices for increasing live animal prices).

(3) The live animal prices on average declined 18 percent below the beginning price in an average duration of 7.8 months.

(4) The retail prices on average declined 7 percent below the beginning price in an average duration of 8.1 months.

The results indicate that retailers responded more readily (with less lag) to declining live animal prices than they did to increasing live animal prices. That is, it took 24 days for retailers to respond to the effect of increasing live animal prices while it took only 15 days for the retailers to adjust to declining live animal prices. This finding tends to refute a common hypothesis that the reverse is the case, that is, that retailers respond more readily to increasing than decreasing live animal prices. In any case, it seems that beef producers and consumers pay more attention to the 15-day delay in retail prices to adjust to falling live animal prices than they do (or never pay any attention at all) to the 24-day delay by retailers in adjusting their prices to increasing farm prices.

The larger percentage changes in live animal than in retail prices confirm what has been discussed elsewhere in the study that farm prices were more variable than retail prices during the period under study.

CHAPTER VIII

SUMMARY

The primary objective of this study was to present a historical analysis of beef price spreads during the period 1954-75, in an attempt to contribute to a better understanding of the nature and causes of changes in these spreads over time. The major questions this study attempted to answer were: what are beef price spreads and how do they differ from industry gross margins? Do price spreads measure marketing efficiency? Does the farmer's share measure his profit position? Are the profits of marketing agencies excessive? What have been the secular, seasonal, cyclical and irregular trends in beef price spreads and values, and what factors have been behind these changes? What implications do these trends have for the cattle producer, marketer and beef consumer? And finally, what has been the lag between live animal and retail beef price movements?

In order to answer these questions, past literature, especially from the U.S. Department of Agriculture, was used. Data were also obtained from the Department, and Time Series analysis was employed in isolating the secular, seasonal, cyclical and irregular trends to facilitate the description, analysis, and interpretation of these trends. The following is a condensation of the findings of this study.

Differences between farm and carcass values, and between carcass and retail values are the farm-carcass and carcass-retail price spreads. These two spreads add up to the farm-retail price spread. Stated differently, farm-retail price spread is the difference between the average retail price

per pound for representative retail cuts of beef and the net farm value of the quantity of live animal (2.28 lbs) that will yield 1 pound of retail cuts. It represents gross marketing costs, including profits, incurred between cattle producers and retail-store checkout counters. It includes the sum of charges for marketing and slaughtering livestock; breaking the dressed, chilled carcass into wholesale cuts; transportation to consuming centers; local delivery to retail stores; cutting and packaging for the retail case; retail store selling expenses, including overhead; and profits.

Price spreads are not synonymous with gross margins. Gross margin is often used by industry to mean the difference between what a retailer or packer gets for his product per unit sold and what he paid for it. Gross margin includes costs of labor, packaging, etc. and overhead as well as any profit for an individual firm between any two market levels. Price spreads include all the costs and profits of all firms between any two market levels for equivalent quantities of a product. Thus, a price spread is larger than a gross margin of a firm between two market levels.

An absolute amount of farm-retail price spread is not a reliable indicator of physical efficiency in marketing, nor is the farmer's share a satisfactory measure of the farmer's economic well-being. Operational efficiency involves a comparison of output and input. The product produced by the marketing system is services rather than goods. The farmer's share of the consumer's beef dollar has dropped despite the fact that cattle prices are considerably higher today than they were in 1954. With no change in farm prices or production costs, the farmer's share can fall simply as a result of more processing, transportation, packaging, or other services.

Available data suggest that overall profits in beef packing and retailing have not been excessive relative to all manufacturing industries

in the country.

Secularly, time series analysis indicates that during 1954-75 period, the trend in beef farm-retail price spread was generally upward and increased at an increasing rate, especially from mid 1960's. This upward trend was closely associated with a rapid increase in average hourly earnings of workers in meat packing firms and retail stores, as well as increases in other costs of supplies and services bought by marketing firms, such as containers and packaging materials, fuel, power and light, rent, telephone, banking, shipping and delivery costs, etc.

The upward trend in the farm retail price spread resulted mainly from the upward trend in the carcass-retail price spread rather than the farm-carcass portion, whose trend was slightly downward during most of the period. The carcass-retail spread includes the cutting, processing, packaging and merchandising of retail cuts of beef. This spread increased because of the rapidly rising labor and other costs. Extra labor was required as a result of the trend towards removing bones from more cuts and the practice of trimming more of the fat from the cuts in recent years. Improved technology and increases in efficiency by beef packers and processors were greater than the increases in costs of labor and equipment, resulting in the slowly declining farm-carcass spread, until the last 4 years which have witnessed an upward trend in this spread as well.

If the past upward trend in farm-retail price spread continues, it will mean that the farmer's share of the consumer's beef dollar will continue to decline, and that the beef consumer will be faced with higher retail prices as the increased costs of providing marketing services are passed on to him.

Seasonally, variations in price spreads reflected the varying effects of price adjustments occasioned by seasonal changes in beef production and marketings, and seasonal shifts in consumer spending. Generally, seasonal variations in price spreads were inversely related to those in beef prices (hence values); spreads widened when prices were falling and narrowed when prices were rising, because of time lags in retail price adjustment as the cattle and beef are traded and moved through the processing and distribution system. A cattle producer can use knowledge of seasonal pattern to plan his production and marketing programs in order to take advantage of months of favorable prices.

Cyclically, fluctuations in price spreads generally directly followed fluctuations in beef values which in turn generally moved in inverse relationship to the cattle cycle; that is, when cattle inventory was accumulating, beef prices (hence values and spreads) were declining and vice versa with a one to two year lag. Increasing inventory meant increasing supplies to the market and hence decreasing prices. A knowledge of cyclical movements can guide a cattle producer or potential cattle producer as to when to undertake a major investment so as to benefit from rising prices.

Irregular movements in price spreads were inversely related to movements in beef prices, which were caused by a number of unusual or random factors such as adverse weather, labor strike, price ceiling and unceiling. An astute businessman can recognize such past random factors and therefore, provide sufficient insurance against possible future similar unfavorable factors.

A tabular analysis of lead-lag relationship between live animal and retail beef prices revealed that retailers responded more readily (with less lag) to declining live animal prices than they did to increasing live

animal prices. This finding tends to refute the hypothesis that the reverse is the case. The average beginning lag in retail prices to increasing live animal prices was equal to the average ending lag to decreasing live animal prices, and was 24 days; the average ending lag in retail prices to increasing live animal prices was equal to the average beginning lag to decreasing live animal prices and was equal to 15 days. Stated differently, beef retailers did not increase their prices until 24 days after live animal prices had started rising; they stopped increasing their retail prices 15 days after live animal prices had stopped rising; they started reducing their prices 15 days after the live animal prices had started falling; and they stopped reducing their prices 24 days after live animal prices had stopped falling. These adjustment lags in retail prices to changes in live animal prices caused price spreads to narrow when prices were rising and to widen when the prices were falling on a monthly and seasonal basis.

SELECTED BIBLIOGRAPHY

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Books

Chao, Lincoln L. Statistics: Methods and Analysis. New York: McGraw-Hill Book Company, 1969.

Darrah, L. B. Food Marketing. New York: The Ronald Press Company, 1971.

Fowler, Stewart H. The Marketing of Livestock and Meat. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1961.

McCoy, John H. Livestock and Meat Marketing. Westport, Connecticut: The AVI Publishing Company, Inc., 1972.

Meyers, Cecil H. Elementary Business and Economic Statistics. Belmont, California: Wadsworth Publishing Company, Inc., 1970.

Phillips, Richard. Managing for Greater Return in Grain, Feed and Other Retail Business Serving Agriculture. Manhattan, Kansas: AG Press, 1973.

Shepherd, Geoffrey S. and Futrell, A. Gene. Marketing Farm Products. Ames, Iowa: The Iowa State University Press, 1969.

Snedecor, George W., and Cochran, G. William. Statistical Methods. Ames, Iowa: The Iowa State University Press, 1973.

Williams, Willard F., and Stout, T. Thomas. Economics of the Livestock Meat Industry. New York: The MacMillan Company, 1964.

Published Reports

Elam, T. E. Focus on Marketing Margins, material prepared for Illinois Farm and Food Outlook, College of Agriculture, Department of Agricultural Economics, University of Illinois at Urbana-Champaign, Urbana, Illinois, 28 August 1975.

George, P. S., and King, G. A. Technical Research Report on Consumer Demand for Food Commodities in the United States with Projections for 1980, Giannini Foundation Monograph Number 26, University of California, Berkeley, March 1971.

Report of the USDA Task Force on Livestock-Meat Price Spread. By Don Paarlberg, Chairman. Washington, D.C.: Government Printing Office, August 1974.

Journal Articles

Goldberg, Ray A.; Ogren, E. Kenneth; and Been, O. Richard. "Marketing Costs and Margins," Journal of Farm Economics, Vol. 47, No. 5 (December 1965): 1352-1380.

Hoos, Sidney; DeLoach, D. B.; Farstad, Edmund; and Bartlett, Ronald W. "The Behavior of Marketing Margins," Journal of Farm Economics, Volume XXXIV, Number 5 (December 1952): 912-929.

Locklin, Philip D; Ogren, E. Kenneth; Atchley, H. Frank; Thompson, W. H.; West, I. Vincent; and Eggert, R. J. "What is behind Widening Marketing Price Spread?" Journal of Farm Economics, Volume XXXVIII, Number 5 (December 1956): 1556-1593.

Public Documents

Bureau of Economics. Economic Report on Food Chain Profits. Staff Report to the Federal Trade Commission. 1975.

U.S. Department of Agriculture, Economic Research Service. Agricultural Outlook. Washington, D.C.: Government Printing Office, August 1975-December 1975.

U.S. Congress and Senate. Cost Components of Farm-Retail Price Spreads for Foods. Report of the National Commission on Food Marketing, June 1966.

U.S. Department of Commerce, Bureau of the Census. Decomposition of Economic Time Series. Science, Vol. 128, No. 3338, December 1958.

U.S. Department of Agriculture, Economic Research Service. Developments in Marketing Spreads for Agricultural Products in 1974, Agricultural Economic Report No. 261. Washington, D.C.: Government Printing Office, April 1975.

U.S. Department of Agriculture, Agricultural Marketing Service, Marketing Research Service. Farm-Retail Spreads for Food Products, Miscellaneous Publication No. 741. Washington, D.C.: Government Printing Office, November 1957.

U.S. Department of Agriculture, Economic Research Service. Farm-Retail Spreads for Food Products. Miscellaneous Publication No. 741. Washington, D.C.: Government Printing Office, January 1972.

U.S. Department of Agriculture, Economic Research Service. Farm-Retail Price Spreads for Beef and Pork, ERS 597. Washington, D.C.: Government Printing Office, February 1975.

U.S. Department of Agriculture, Economic Research Service. Marketing and Transportation Situation. Washington, D.C.: Government Printing Office, 1954-July 1975.

U.S. Department of Agriculture, Economic Research Service. Price Spreads for Beef and Pork: Revised Series 1949-69, Miscellaneous Publication No. 1174. Washington, D.C.: Government Printing Office, May 1970.

U.S. Department of Agriculture, Economic Research Service, Marketing Economics Research Division. Seasonal Variations in Farm Food Prices and Price Spreads, Miscellaneous Publication No. 840. Washington, D.C.: Government Printing Office, January 1961.

Unpublished Material

Braunschweig, Robert T. "The Overstatement of Marketing Margins by the U.S. Department of Agriculture," R. W. Braunschweig's testimony before a U.S. Congressional Committee discussing the difficult and complex issue of farm-retail margins on beef. The Kroger Company, Cincinnati, Ohio, 19 November 1974.

Ginn, Bruce A. "Marketing Margins for Beef and Related Considerations," paper prepared for South Dakota Beef Field Day, Western Livestock Marketing Information Project, 31 October 1975.

Hays, Henry M., Jr. "The Organization of the Staple Food Grain Marketing System in Northern Nigeria: A Study of Efficiency of the Rural-Urban Link," Ph.D. dissertation, Kansas State University, 1973.

Seltzer, Richard. "Pricing Within the Food Processing Industry," paper prepared for In-House Use on Contract No. WQ5A Coll. National Commission on Water Quality, Development Planning and Research Associates, Inc., Manhattan, Kansas, April 1975.

APPENDIX A

TABLE 15.--- Monthly farm, carcass, and retail values, and farm-carcass, carcass-retail, and farm-retail price spreads in cents per retail pound for choice, grade beef, U.S., January 1954 - September 1979.

Year	Month	X^a	X^b	Farm Value	Carcass Value	Retail Value	Farm-Carcass	Carcass-Retail	Farm-Retail
				---------- Cents ----------					
1954	January	1	-130	46.5	54.8	68.5	8.5	13.5	22.0
	February	2	-129	44.3	51.7	67.5	6.8	15.8	22.6
	March	3	-128	44.7	49.8	66.6	5.1	16.8	21.9
	April	4	-127	45.8	52.2	66.6	6.5	14.4	20.7
	May	5	-126	45.5	53.8	67.6	8.3	13.8	22.1
	June	6	-125	44.7	52.2	68.1	7.5	15.9	23.4
	July	7	-124	44.8	53.7	67.6	8.9	13.9	22.8
	August	8	-123	45.5	53.7	66.8	8.2	13.1	21.3
	September	9	-122	47.4	56.5	67.9	9.1	11.4	20.5
	October	10	-121	47.8	55.9	68.2	8.5	12.3	20.6
	November	11	-120	45.8	57.2	69.3	8.4	12.1	20.5
	December	12	-119	50.5	58.0	69.2	7.7	11.2	18.9
Annual Average				46.4	54.1	67.8	7.7	13.7	21.4
1955	January	13	-118	51.1	59.6	69.4	8.5	9.8	18.3
	February	14	-117	49.2	57.2	69.0	8.0	11.8	19.8
	March	15	-116	49.0	55.7	68.2	6.7	12.5	19.2
	April	16	-115	46.9	55.4	67.9	8.5	12.5	21.0
	May	17	-114	44.1	52.0	66.3	7.9	14.3	22.2
	June	18	-113	43.3	51.1	66.7	7.8	15.6	23.4
	July	19	-112	43.3	50.8	66.1	7.5	15.3	22.8
	August	20	-111	43.1	51.6	66.0	8.5	14.4	22.9
	September	21	-110	43.6	53.6	66.7	10.0	13.1	23.1
	October	22	-109	42.0	51.4	66.3	9.4	14.9	24.3
	November	23	-108	39.5	49.0	64.9	9.5	15.9	25.4
	December	24	-107	38.2	46.7	64.1	8.5	17.4	25.9
Annual Average				44.4	52.8	66.8	8.4	14.0	22.4
1956	January	25	-106	38.2	48.4	62.9	10.2	14.5	24.7
	February	26	-105	35.7	44.3	61.4	8.6	17.1	25.7
	March	27	-104	36.7	44.0	60.2	7.3	16.2	23.5
	April	28	-103	38.6	45.6	60.8	7.0	15.2	22.2
	May	29	-102	38.9	45.5	62.0	6.6	16.5	23.1
	June	30	-101	39.3	48.8	63.1	9.0	14.3	23.3
	July	31	-100	42.6	51.2	64.3	8.6	13.1	21.7
	August	32	- 99	49.2	58.7	67.5	9.5	8.8	18.3
	September	33	- 98	51.7	62.4	71.7	10.7	9.3	20.0
	October	34	- 97	49.4	59.9	72.2	10.5	12.3	22.8
	November	35	- 96	44.8	54.1	70.3	9.3	16.2	25.5
	December	36	- 95	41.1	50.0	67.9	8.9	17.9	26.8
Annual Average				42.2	51.1	65.4	8.9	14.3	23.2
1957	January	37	- 94	40.1	50.1	66.1	10.0	16.0	26.0
	February	38	- 93	38.7	47.5	65.9	8.8	18.4	27.2
	March	39	- 92	42.0	50.3	65.0	8.2	14.7	22.9
	April	40	- 91	44.2	52.4	67.7	8.2	15.3	23.5
	May	41	- 90	44.8	52.9	69.2	8.1	16.3	24.4
	June	42	- 89	44.8	53.2	70.0	8.4	16.8	25.2
	July	43	- 88	48.2	57.2	71.2	9.0	14.5	23.5
	August	44	- 87	49.2	58.2	72.7	9.0	14.5	23.5
	September	45	- 86	47.5	55.6	73.2	7.8	17.6	25.4
	October	46	- 85	46.7	54.2	72.0	7.4	17.8	25.2
	November	47	- 84	48.3	57.0	71.7	8.7	14.7	23.4
	December	48	- 83	50.4	58.7	73.6	7.3	15.9	23.2
Annual Average				45.4	53.9	69.9	8.5	16.0	24.5
1958	January	49	- 82	52.5	61.6	76.5	9.0	14.9	23.9
	February	50	- 81	53.6	60.9	77.6	7.3	16.7	24.1
	March	51	- 80	57.8	63.4	79.9	5.6	16.5	22.1
	April	52	- 79	57.4	63.7	82.0	6.3	18.3	24.6
	May	53	- 78	56.4	64.4	81.7	8.0	17.3	25.3
	June	54	- 77	55.0	62.0	82.2	7.0	20.2	27.2
	July	55	- 76	54.9	61.6	82.1	6.7	20.5	27.2
	August	56	- 75	50.9	58.2	79.9	7.3	21.7	29.0
	September	57	- 74	52.3	59.6	79.6	7.3	20.0	27.4
	October	58	- 73	53.1	60.6	79.9	8.5	19.3	27.8
	November	59	- 72	52.0	60.4	80.2	8.4	19.8	28.2
	December	60	- 71	53.4	61.8	80.5	8.4	18.7	27.1
Annual Average				54.0	61.5	80.2	7.5	18.7	26.2
1959	January	61	- 70	55.5	64.2	81.8	8.7	17.6	26.2
	February	62	- 69	54.7	63.2	82.5	8.5	19.3	27.8
	March	63	- 68	56.2	63.3	82.4	7.1	19.1	26.2
	April	64	- 67	57.6	65.6	82.5	8.0	16.9	24.9
	May	65	- 66	57.3	65.0	82.9	7.7	17.9	25.6
	June	66	- 65	55.2	63.3	82.5	8.1	19.2	27.3
	July	67	- 64	54.2	62.4	82.8	8.2	20.4	28.6
	August	68	- 63	53.6	60.3	81.3	6.7	20.9	27.6
	September	69	- 62	53.3	62.1	81.3	8.8	19.2	27.9
	October	70	- 61	52.8	60.7	81.4	8.1	20.7	28.8
	November	71	- 60	51.3	58.1	81.5	6.7	23.4	30.1
	December	72	- 59	50.4	57.3	81.1	6.9	23.7	30.7
Annual Average				54.4	62.1	82.0	7.7	19.9	27.6

TABLE 11.— Continued.

Year	Month	X^A	X^B	Farm Value	Farm-to Value	Retail Value	Farm-Farmer	Charges-Retail	Farm-Retail
				——— Cents ———					
1960	January	73	- 58	52.8	61.1	80.7	8.3	19.6	27.9
	February	74	- 57	53.6	61.0	80.2	8.5	19.6	27.1
	March	75	- 56	53.4	61.1	80.4	6.7	19.3	26.0
	April	76	- 55	55.3	62.8	81.8	7.3	19.0	26.3
	May	77	- 54	54.3	61.0	81.3	7.7	19.3	27.0
	June	78	- 53	52.0	53.0	80.7	6.9	21.8	28.7
	July	79	- 52	52.3	58.7	80.1	7.7	21.4	29.1
	August	80	- 51	49.8	57.9	80.0	8.1	22.1	30.2
	September	81	- 50	49.0	56.4	79.2	7.4	22.8	30.2
	October	82	- 49	48.7	56.1	78.8	7.4	22.7	30.1
	November	83	- 48	50.3	56.6	78.9	6.3	22.3	28.6
	December	84	- 47	52.8	60.0	79.7	7.2	19.7	26.9
Annual Average				52.1	59.5	80.2	7.4	20.7	28.1
1961	January	85	- 46	54.0	61.6	81.3	7.6	19.7	27.3
	February	86	- 45	52.2	60.8	81.0	8.6	20.2	28.8
	March	87	- 44	50.7	58.6	80.5	7.9	21.9	29.8
	April	88	- 43	49.3	56.7	79.8	7.4	23.1	30.5
	May	89	- 42	46.0	54.0	78.6	8.0	24.6	32.6
	June	90	- 41	44.4	52.7	76.5	8.3	23.8	32.1
	July	91	- 40	44.4	52.1	75.5	7.7	23.4	31.1
	August	92	- 39	46.9	55.0	75.8	8.1	20.8	28.9
	September	93	- 38	47.8	54.8	76.9	7.0	22.1	29.1
	October	94	- 37	48.2	55.5	77.3	7.3	21.8	29.1
	November	95	- 36	49.8	55.5	78.2	5.7	22.7	28.4
	December	96	- 35	51.4	58.0	78.8	6.6	20.8	27.4
Annual Average				48.8	56.3	78.4	7.5	22.1	29.6
1962	January	97	- 34	52.8	60.2	79.4	7.4	19.2	26.6
	February	98	- 33	53.2	60.4	79.7	7.2	19.2	26.5
	March	99	- 32	54.2	60.9	81.0	6.7	20.1	26.8
	April	100	- 31	54.6	60.9	80.7	6.3	19.8	26.1
	May	101	- 30	52.2	59.4	79.8	7.2	20.6	27.6
	June	102	- 29	50.8	57.9	79.9	7.1	22.0	29.1
	July	103	- 28	52.8	59.5	79.8	6.7	20.3	27.0
	August	104	- 27	56.4	62.7	80.9	6.3	18.2	24.5
	September	105	- 26	59.5	65.8	84.9	6.3	19.1	25.4
	October	106	- 25	58.4	64.1	84.3	5.7	20.2	25.9
	November	107	- 24	59.5	65.5	85.0	6.0	19.5	25.5
	December	108	- 23	58.2	64.6	84.5	6.4	19.9	26.3
Annual Average				55.2	61.8	81.7	6.6	19.9	26.5
1963	January	109	- 22	55.2	61.5	85.5	6.3	22.0	28.3
	February	110	- 21	50.5	56.8	80.7	6.3	23.9	30.2
	March	111	- 20	46.8	53.5	77.7	6.7	24.2	30.9
	April	112	- 19	47.5	53.9	78.0	6.4	24.1	30.5
	May	113	- 18	45.2	52.9	75.8	7.7	22.9	30.6
	June	114	- 17	46.0	53.4	75.8	7.4	22.4	29.8
	July	115	- 16	50.8	57.3	77.4	6.5	20.1	26.6
	August	116	- 15	50.2	56.9	79.0	6.7	22.1	28.8
	September	117	- 14	49.2	56.4	79.4	7.2	23.0	30.2
	October	118	- 13	48.4	55.4	78.7	7.0	23.3	30.3
	November	119	- 12	46.8	53.8	78.5	7.0	24.7	31.7
	December	120	- 11	44.3	51.8	77.9	7.5	26.1	33.6
Annual Average				48.4	55.3	78.5	6.9	23.2	30.1
1964	January	121	- 10	45.7	53.1	76.7	7.4	23.6	31.0
	February	122	- 9	43.1	51.4	76.1	8.3	24.7	33.0
	March	123	- 8	43.6	51.0	74.7	7.4	23.7	31.1
	April	124	- 7	42.4	50.4	73.6	8.0	23.2	31.2
	May	125	- 6	41.0	48.8	73.4	7.8	24.6	32.4
	June	126	- 5	43.9	50.7	73.6	6.8	22.9	29.7
	July	127	- 4	47.4	54.1	75.7	6.7	21.6	28.3
	August	128	- 3	50.4	57.5	77.4	7.1	19.9	27.0
	September	129	- 2	51.6	57.9	80.1	6.3	22.2	28.5
	October	130	- 1	49.5	55.5	78.9	6.0	23.4	29.4
	November	131	0	48.7	55.0	79.2	6.3	24.2	30.5
	December	132	1	47.7	54.2	78.9	6.5	24.7	31.2
Annual Average				46.2	53.3	76.5	7.1	23.2	30.3
1965	January	133	2	48.1	54.7	76.9	6.6	22.2	28.8
	February	134	3	47.2	53.6	76.2	6.4	22.6	29.0
	March	135	4	48.4	54.5	75.5	6.1	21.0	27.1
	April	136	5	50.9	57.5	77.5	6.6	21.0	26.6
	May	137	6	54.0	60.4	79.3	6.4	18.9	25.3
	June	138	7	56.0	62.3	82.9	6.3	20.6	26.9
	July	139	8	54.3	60.7	83.8	6.4	23.1	29.5
	August	140	9	53.0	60.1	82.9	6.3	22.8	29.1
	September	141	10	53.1	59.6	81.7	6.5	22.1	28.6
	October	142	11	54.3	59.2	81.2	5.9	23.0	28.9
	November	143	12	51.4	57.6	81.9	6.2	24.3	30.5
	December	144	13	52.1	58.0	81.6	5.9	23.6	29.5
Annual Average				51.8	58.0	80.1	6.2	22.1	28.3

TABLE 1 — Continued.

Year	Month	$\bar{x}^a$	s^b	Farm Value	Carcase Value	Retail Value	Farm-Carcase	Carcase-Retail	Farm-Retail
						Cents			
1966	January	135	14	52.3	59.6	81.0	6.8	21.4	28.2
	February	136	15	50.0	61.1	82.1	8.1	21.0	29.1
	March	137	16	51.0	62.1	84.1	9.3	21.9	31.2
	April	138	17	56.0	60.7	84.6	4.7	23.9	28.6
	May	139	18	52.6	58.7	83.8	6.1	25.1	31.2
	June	140	19	50.3	56.9	81.7	6.1	24.8	30.9
	July	141	20	50.5	56.9	81.5	6.4	24.6	31.0
	August	142	21	51.6	57.8	81.7	6.2	23.9	30.1
	September	143	22	52.0	58.1	82.3	6 1	24.1	30.2
	October	144	23	50.6	56.4	81.3	5.8	24.9	30.7
	November	145	24	49.4	55.7	80.3	6.3	24.6	30.9
	December	146	25	49.3	56.4	83.6	7.1	27.2	34.3
Annual Average				52.3	58.4	82.4	6.2	23.9	30.1
1967	January	147	26	51.1	58.2	80.4	7.1	22.2	29.3
	February	148	27	50.1	56.3	80.9	6.2	24.6	30.8
	March	149	28	49.7	55.2	80.8	5.5	25.6	31.1
	April	150	29	50.0	56.3	80.4	6.3	24.1	30.4
	May	151	30	51.8	58.3	79.6	6.5	21.3	27.8
	June	152	31	53.5	59.9	81.9	6.4	22.0	28.4
	July	153	32	55.0	61.6	83.3	6.6	21.7	28.3
	August	154	33	56.2	62.1	84.0	5.9	21.9	27.8
	September	155	34	56.4	63.0	85.5	6.6	22.5	29.1
	October	156	35	54.8	61.1	85.5	6.3	24.2	30.5
	November	157	36	53.7	60.2	84.4	6.5	24.2	30.7
	December	158	37	54.2	60.7	85.3	6.5	24.6	31.1
Annual Average				53.0	59.4	82.6	6.4	23.2	29.6
1968	January	159	38	54.6	61.1	84.3	6.5	23.2	29.7
	February	160	39	55.7	62.4	85.1	6.7	22.7	29.4
	March	161	40	56.4	62.4	85.6	6.0	23.2	29.2
	April	162	41	56.0	62.3	85.6	6.3	23.3	29.6
	May	163	42	55.7	62.1	85.8	6.4	23.7	30.1
	June	164	43	55.9	62.6	85.8	6.7	23.2	29.9
	July	165	44	57.7	64.2	87.1	6.5	22.9	29.4
	August	166	45	57.9	64.2	87.0	6.3	22.8	29.1
	September	167	46	57.4	63.9	88.4	6.5	24.5	31.0
	October	168	47	56.6	62.7	87.7	6.1	25.0	31.1
	November	169	48	57.8	63.9	88.1	6.1	24.2	30.3
	December	170	49	59.1	65.6	88.5	6.5	22.9	29.4
Annual Average				56.7	63.1	86.6	6.4	23.5	29.9
1969	January	171	50	58.9	65.8	89.5	6.9	23.7	30.6
	February	172	51	58.8	64.8	89.6	6.0	24.8	30.8
	March	173	52	61.5	67.6	90.9	6.1	23.3	29.4
	April	174	53	63.8	69.9	93.3	6.1	23.4	29.5
	May	175	54	70.0	76.3	97.8	6.3	21.5	27.8
	June	176	55	71.7	77.6	101.9	5.9	24.3	30.2
	July	177	56	65.8	73.0	102.4	7.2	29.4	36.6
	August	178	57	63.0	69.5	101.1	6.5	31.6	38.1
	September	179	58	59.6	66.7	99.1	7.1	32.4	39.5
	October	180	59	57.7	64.1	95.2	6.4	31.7	37.5
	November	181	60	57.7	63.9	96.5	6.2	32.6	38.8
	December	182	61	58.5	65.0	96.9	6.5	31.9	38.4
Annual Average				62.2	68.7	96.2	6.5	27.5	34.0
1970	January	183	62	58.8	67.5	97.5	8.7	30.0	38.7
	February	184	63	60.7	67.3	97.3	6.6	30.0	36.6
	March	185	64	64.6	71.0	99.4	6.4	28.4	34.8
	April	186	65	64.0	70.4	99.9	6.4	29.5	35.9
	May	187	66	61.9	68.1	99.4	6.2	31.3	37.5
	June	188	67	63.8	69.5	98.5	5.6	29.0	34.7
	July	189	68	65.4	72.4	100.7	7.0	28.3	35.3
	August	190	69	63.0	70.3	100.4	7.3	30.1	37.4
	September	191	70	61.7	68.3	98.7	6.7	30.4	37.0
	October	192	71	60.2	66.3	97.9	6.1	31.6	37.7
	November	193	72	57.4	65.0	97.6	7.6	32.6	40.2
	December	194	73	56.3	63.5	96.5	7.2	33.0	40.3
Annual Average				61.5	68.3	98.6	6.8	30.3	37.1
1971	January	195	74	60.3	69.9	97.2	9.6	27.3	36.9
	February	196	75	67.4	74.7	101.3	7.3	26.6	33.9
	March	197	76	66.7	74.0	102.2	7.3	28.2	35.5
	April	198	77	67.3	75.7	102.0	7.9	26.3	34.2
	May	199	78	68.5	77.5	104.8	9.0	27.2	36.2
	June	200	79	67.8	75.7	105.7	7.9	30.0	37.9
	July	201	80	67.8	75.5	106.7	7.7	29.2	36.9
	August	202	81	69.3	77.3	107.7	7.7	28.4	36.1
	September	203	82	68.1	75.8	105.9	7.7	30.1	37.8
	October	204	83	67.3	76.1	103.1	8.8	26.3	37.0
	November	205	84	70.9	77.5	104.5	6.6	26.7	33.4
	December	206	85	71.5	77.9	104.3	6.4	26.4	32.8
Annual Average				68.0	76.1	104.5	7.9	28.4	36.3

TABLE 15.-- Continued.

Year	Month	n[a]	x[b]	Farm Value	Farmgate Value	Retail Value	Farm-Farmgate	Farmgate-Retail	Farm-Retail
				cents					
1972	January	217	86	74.0	82.5	111.5	8.5	29.0	37.5
	February	218	87	74.9	82.7	115.8	7.8	33.1	40.9
	March	219	88	71.3	79.1	115.8	7.8	36.7	44.0
	April	220	89	70.2	77.4	112.0	7.2	34.6	41.8
	May	221	90	72.8	81.2	111.4	8.4	30.2	38.6
	June	222	91	77.4	85.2	113.5	7.8	28.3	36.1
	July	223	92	77.3	84.4	117.3	7.1	32.9	40.0
	August	224	93	70.9	78.6	115.8	7.7	37.2	44.9
	September	225	94	69.5	76.8	112.9	7.3	36.1	43.4
	October	226	95	69.0	76.5	112.8	7.5	36.3	43.8
	November	227	96	66.5	74.2	112.3	7.7	38.1	45.8
	December	228	97	74.5	82.7	114.6	8.2	31.9	40.1
Annual Average				72.4	80.1	113.8	7.7	33.7	41.4
1973	January	229	98	82.2	90.4	122.1	8.2	31.7	39.9
	February	230	99	87.4	95.9	130.3	8.5	34.4	43.0
	March	231	100	92.2	99.3	135.3	7.2	36.0	43.1
	April	232	101	91.1	99.8	136.0	8.7	36.2	44.9
	May	233	102	92.5	99.2	136.0	6.7	36.8	43.5
	June	234	103	94.4	101.5	135.5	7.1	34.0	41.1
	July	235	104	96.5	102.7	136.3	6.2	33.6	39.8
	August	236	105	108.3	111.8	144.2	3.5	32.4	35.9
	September	237	106	91.7	100.2	144.9	8.5	44.7	53.2
	October	238	107	83.0	92.7	136.0	9.7	43.3	53.0
	November	239	108	79.8	90.3	134.9	10.5	44.6	55.1
	December	240	109	79.4	93.6	134.4	14.2	40.8	55.0
Annual Average				89.9	98.1	135.5	8.2	37.4	45.6
1974	January	241	110	96.6	107.1	143.0	10.5	35.9	46.4
	February	242	111	94.1	108.3	150.0	14.2	41.7	55.9
	March	243	112	85.6	96.3	142.2	10.6	45.9	56.5
	April	244	113	84.2	95.0	136.4	10.8	41.4	52.2
	May	245	114	83.1	95.5	135.0	12.4	39.5	51.9
	June	246	115	77.7	90.2	132.2	12.5	42.0	54.5
	July	247	116	90.9	103.4	137.9	12.5	34.5	47.0
	August	248	117	97.7	106.6	143.4	8.9	36.8	45.7
	September	249	118	85.2	96.2	141.6	11.0	45.4	56.4
	October	250	119	82.0	93.4	136.8	11.4	43.4	54.8
	November	251	120	78.7	89.9	134.4	11.1	44.6	55.7
	December	252	121	77.1	87.5	132.2	10.4	44.7	55.1
Annual Average				86.1	97.4	138.8	11.3	41.4	52.7
1975	January	253	122	76.6	88.8	132.8	12.2	44.0	56.2
	February	254	123	73.2	84.7	129.0	11.5	44.3	55.8
	March	255	124	75.7	86.3	127.0	10.6	40.7	51.3
	April	256	125	89.9	101.2	133.9	11.3	32.7	44.0
	May	257	126	103.9	115.9	147.8	12.0	31.9	43.9
	June	258	127	110.2	123.2	157.8	13.0	34.6	47.6
	July	259	128	105.8	119.7	161.0	13.9	41.3	55.2
	August	260	129	96.8	112.1	155.5	15.3	43.4	58.7
	September	261	130	100.2	114.5	152.8	14.3	38.3	52.6
3-Quarter Average				92.4	105.1	144.2	12.7	39.0	51.7

[a] -- Position of the month from January 1954 to September 1975.

[b] -- Position of the corresponding month from the median month - November 1964. Negative x values are for the months which come before November 1964, and positive x values are for the months which come after November 1964. Thus, the value of x for November 1964 equals 0.

Source: Compiled from data obtained by request from Denis Dunham, an Agricultural Economist in the Sector Performance Measures, Economic Research Service, U.S. Department of Agriculture, Washington, D.C., and from the "Agricultural Outlook" series published quarterly by the USDA.

APPENDIX B

APPENDIX B

HOW RETAIL PRICE, WHOLESALE PRICE AND FARM PRICE USED IN COMPUTING BEEF VALUES AND PRICE SPREADS ARE DERIVED[1]

Retail Price:

Retail price per pound of choice beef is the estimated average price of all salable cuts obtained from a choice carcass, including ground beef and stew meat. Prices obtained by Economic Research Service of the U. S. Department of Agriculture (ERS) from a group of retail food chains, as well as Bureau of Labor Statistics (BLS) prices, have been used in calculating this price.

ERS now receives weekly retail price reports from 26 retail food chains. Seven report for more than one of their divisions. Headquarters of the 40 divisions reporting are located in 27 Standard Metropolitan Statistical Areas (SMSA)--six in the Northeast, seven in the North Central region, 10 in the South, and four in the West.

Each division's report contains the weekly price list and other information sent to stores in its territory. The list gives regular prices for all cuts and also prices for cuts on special sale.

ERS calculates two simple averages of prices reported for each cut by

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[1] U.S., Department of Agriculture, Economic Research Service, Farm-Retail Spreads for Food Products, Miscellaneous Publication No. 741 (Washington, D.C.: Government Printing Office, January 1972), pp. 71-75.

food chain divisions in each of the four regions. One average is for regular prices--those prevailing in the absence of special sales. The other--"specials-included" average--is calculated from regular prices and from special-sales prices for divisions reporting special prices. ERS uses a weekend special-sales price for the entire week. However, ERS does not use a special-sales price which applies only during the first part of the week and has been carried over from the preceding week.

To obtain a U.S. average of regular prices and a U.S. specials-included average for each month, ERS weights regional monthly averages for each cut. Weights were calculated from regional per capita consumption and population data. ERS derives monthly prices for each cut by averaging weekly prices.

In calculating average retail prices of choice beef cuts, ERS uses BLS prices for the cuts for which they are available, instead of food chain prices. To derive regular and specials-included prices, ERS adjusts BLS prices by using U.S. average prices computed from food chain prices. For example, two-thirds of the difference between the regular and the specials-included price of round steak is added to the BLS price of that cut to derive an adjusted BLS regular price. The remaining third of the difference is subtracted from the BLS price to derive the BLS specials-included price. Prices are derived for the other BLS-priced cuts in the same manner. These adjusted BLS prices are converted to a monthly basis by adding to or subtracting from them differences between corresponding weekly and monthly chain-store average prices.

Adjustments by ERS are designed to derive one price that is an average of all prices and another price that is an average of regular prices only. BLS prices are not affected by all special prices in the BLS

sample of stores--for example, weekend special prices in stores visited on Tuesday. BLS prices are used instead of chain prices because they are considered more representative of prices in stores of various types and sizes throughout the United States. BLS-priced cuts account for about 47 percent of the weight of all salable cuts per 100 pounds of choice carcass, including ground beef and stew meat.

ERS weights U.S. average prices of cuts to calculate two U.S. average prices of choice beef--a U.S. composite regular price and a U.S. composite specials-included price. Weights used are the estimated average weights of cuts sold per 100 pounds of choice beef carcass (See Table 14).

ERS derives its average price for choice beef by subtracting 65 percent of the difference between the U.S. composite regular and specials-included prices from the latter of these two prices. This adjustment is designed to account for the effect of extra volumes sold at special prices. The composite specials-included price is an estimate of what the average price would be if each cut made up the same proportion of total sales that it represented of the carcass. However, specially priced cuts probably make up larger percentages of total sales than the percentages they represent of the carcass. Retailers make available larger quantities of the cuts on special sale by buying extra portions of the carcass that yield these cuts.

Wholesale price:

ERS estimates U.S. average wholesale prices of choice carcass beef based on Chicago and west coast prices. Price observation at various points shows that except on the west coast, wholesale prices of carcasses throughout the United States vary closely with prices in Chicago. The Chicago price used is the carlot price for choice steer carcasses weighing

TABLE 14.--Beef composite retail price per pound: proportion cuts are of total retail cuts, and retail value per cut and per 100 lb retail cuts from carcass[a]

Item	Percentage of total Retail cuts from carcass[b]	Price per pound	Value/100 lb
	Percent	Dollars	Dollars
Steaks			
Porterhouse, BI[c]	2.1	1.58	3.32
Club, BI	1.3	1.49	1.94
Club, BO[d]	0.5	2.18	1.09
T-bone, BI	3.6	1.55	5.58
Sirloin, BI	6.6	1.33	8.78
Round fullcut, BI	3.6	1.16	4.18
Round top, BO	3.5	1.28	4.48
Round bottom, BO	2.9	1.32	3.83
Chuck steak, BI	2.3	0.74	1.70
Rib, BI	2.0	1.24	2.48
Flank, BO	0.7	1.36	0.95
Roasts			
Rib roast, BI	6.0	1.10	6.60
Rib rolled, BO	1.2	1.57	1.88
Chuck blade, BI	8.2	0.71	5.82
Chuck arm, BI	5.0	0.85	4.25
Chuck roast, BO	5.4	0.94	5.08
Sirloin/Round tip, BO	3.5	1.34	4.64
Eye round, BO	1.5	1.53	2.30
Rump, BO	3.8	1.26	4.79
Rump, BI	1.2	0.94	1.13
Other cuts			
Plate, BI	2.1	0.38	0.80
Short Rib, BI	3.1	0.59	1.83
Brisket, BO	2.8	1.09	3.16
Ground beef	16.4	0.62	10.17
Ground chuck	2.0	0.83	1.66
Stew, BO	6.0	0.93	5.58
Shin or Shank, BO	0.3	0.83	0.25
Shin or Shank, BI	2.0	0.60	1.20
Kidney	0.3	0.39	0.12
Total	100.0	----	99.64[e]

[a]Prices used were for May 1969

[b]The figures shown are net of retail cutting loss and retail shring.

[c]Bone in [d]Bone out

[e]In other words, a composite price per retail pound of 99.6¢

Source: John H. McCoy, "Livestock and Meat Marketing," 1972, Table 15-1, p. 395.

600 to 700 pounds each. This price is adjusted to one representative of the entire United States, except the west coast, by adding 75 cents. This 75-cent differential was estimated by weighting price differences between Chicago and other markets by consumption in areas surrounding those markets; it consists mainly of transportation costs.

A price for the west coast (three Pacific Coast States and Nevada) is derived from a simple average of carlot and less-than-carlot prices for 600 to 700-pound choice carcasses in Los Angeles, San Francisco, and the Seattle-Tacoma-Portland area--six prices in all.

In computing a U.S. average, ERS assigns the west coast price a weight of 0.134; and the price for the rest of the United States, a weight of 0.866. The weights used were calculated from regional consumption and population data.

Prices for the Chicago and west coast markets are simple averages of the mean of the daily range of quotations. The Federal-State Market News Service reports daily ranges from samples of sales believed representative of all sales. Weekly averages are published in "Livestock, Meat, Wool Market News, Weekly Summary and Statistics," a publication of the Livestock Division, Consumer and Marketing Service (C&MS), USDA.

Farm price:

A farm price of choice beef cattle is derived from (1) monthly average prices of choice steers, all weights, at seven leading midwestern markets (Omaha, Sioux City, Kansas City, National Stock Yards, South St. Joseph, Sioux Falls, and South St. Paul); and (2) monthly averages of daily quotations to California feeders and ranchers for choice steers in the 900- to 1,100-pound weight class. Prices at the seven markets are weighted by actual volumes sold to arrive at an average price for those markets. Statistical

Reporting Service of the USDA (SRS) and the Livestock Division, C&MS, collect price and volume data for the seven markets. Livestock Market News Service reporters provide California quotations by gathering information from buyers, feedlot operators, and ranchers and periodically checking sales records.

To convert market prices to a "farm-gate" basis, ERS deducts 60 cents from the average price per 100 pounds for the seven markets and 50 cents from the California quotations to cover costs of assembling and selling. From 1949 on, the same deductions have been made and were estimated from data furnished by market officials and others connected with livestock marketing.

A U.S. average price is calculated by weighting the seven-market price by 0.85 and the California quotation by 0.15. These weights are based on estimated marketings of fed cattle in 3 years--1955, 1961, and 1964--in 39 cattle-feeding states. The weight assigned the California price is the proportion of the total marketed in the three Pacific Coast States and Nevada; the weight assigned the seven-market price is the proportion marketed in the other 35 states.

APPENDIX C

TABLE 15.—Choice 900–1,100# Slaughter Steers, Omaha*

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YEARLY AV.
1955	27.36	26.06	25.65	24.32	22.20	21.82	22.20	21.99	22.49	21.51	20.32	19.54	22.96
1956	20.16	19.54	19.99	20.25	20.24	20.33	21.37	24.80	26.16	25.07	23.36	21.41	21.93
1957	20.94	20.12	21.44	22.28	22.79	22.74	24.60	24.95	24.15	23.94	24.42	25.53	23.16
1958	26.47	27.55	29.31	28.90	28.46	27.40	26.50	25.68	26.21	26.13	26.52	27.23	27.20
1959	28.19	28.02	28.83	29.98	29.08	27.99	27.89	27.41	27.24	26.36	25.62	25.43	27.67
1960	26.26	26.58	27.75	27.88	27.19	25.85	25.02	24.41	24.06	24.26	25.40	26.13	25.90
1961	26.74	26.15	25.52	24.87	23.22	22.42	22.34	23.87	23.78	23.96	24.85	25.51	24.45
1962	25.76	25.95	26.36	26.81	25.50	25.07	25.68	27.41	28.83	28.46	29.12	28.12	26.92
1963	26.49	24.47	22.88	23.10	22.27	22.52	24.57	24.40	23.98	23.74	22.92	21.64	23.58
1964	22.20	21.36	21.38	20.88	20.28	21.25	22.69	24.23	24.75	23.66	23.45	22.79	22.41
1965	22.98	22.53	23.17	24.38	26.00	26.69	26.05	26.28	26.19	25.33	24.93	25.38	24.99
1966	25.31	27.16	28.25	26.94	25.94	25.25	25.27	25.76	25.54	24.70	23.92	23.92	25.71
1967	24.94	24.32	23.92	23.89	24.75	25.45	26.18	26.57	26.63	25.98	25.34	25.48	25.29
1968	25.69	26.37	26.60	26.50	26.30	26.39	27.37	27.54	27.27	27.05	27.38	27.94	26.87
1969	27.74	27.50	28.81	30.14	32.79	33.63	31.29	30.04	28.66	27.60	27.44	27.73	29.45
1970	28.33	29.30	30.99	30.79	29.57	30.36	31.12	30.09	29.21	28.47	27.22	26.82	29.36
1971	29.10	32.18	31.89	32.41	32.86	32.35	32.44	33.10	32.58	32.22	33.30	34.28	32.39
1972	35.63	36.32	35.17	34.52	35.70	37.91	38.38	35.70	34.69	34.92	33.59	36.85	35.78
1973	40.65	43.54	45.65	45.03	45.74	46.76	47.65	52.94	45.12	41.92	40.14	39.36	44.54
1974	47.13	46.37	42.85	41.54	40.52	37.98	43.72	46.62	41.38	39.64	37.72	37.20	41.89

*Monthly average price per hundred weight, Omaha, 1955–74. Monthly averages are based on the mean of daily quotations.

Source: U. S. D. A., Agricultural Marketing Service, Livestock Division.

TIME SERIES ANALYSIS OF BEEF PRICE SPREADS

by

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B. S., Cum Laude, Kansas State University, 1974

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

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1976

ABSTRACT

Beef farm-retail price spread has widened substantially over the past two decades. This has meant that the farmer's share of the consumer's beef dollar has declined over the same period, for the spread and the share are two sides of the same coin. This phenomenon has caused widespread concern among beef producers and consumers who have felt that the spread is growing too wide. They have placed the blame for this widening spread on the beef marketing system and the middleman with the contention that the marketing system is inefficient and/or the middleman is enjoying excessive profits.

This study attempted to put the facts of the widening farm-retail price spread into proper perspective. Farm-retail price spread together with its component parts, the farm-carcass and carcass-retail price spreads, were disaggregated into secular, seasonal, cyclical and irregular trends in order to identify, measure, describe, record and interpret these trends. Only then could the nature of and causes behind these changes in price spreads be comprehensively explained.

Secularly, it was found that indeed the farm-retail price spread has widened and that the trend is upward, increasing at an increasing rate. But rather than reasons for this upward trend being inefficiency or excessive profits in the beef marketing channel, evidence suggested that the trend was due to rapidly rising costs of providing marketing services. Consumers have demanded not only more services, but better services; and

Contrary to popular thinking, the findings of this study suggest that beef retailers responded more readily (with less lag) to decreasing than to increasing live animal prices.

the increase in costs has been due to not only more and better services but also to an inflationary economy. Profits of beef marketing firms were not found to be out of line with those of other manufacturing firms in the country; and hence, the claim by beef producers and consumers that these profits are excessive seemed unsubstantiated by the evidence obtained.

The secular increase in the farm-retail price spread resulted mainly from the increase in the carcass-retail portion rather than the farm-carcass portion which actually declined during most of the 1954-75 period. The carcass-retail spread increased because of the rapidly rising labor and other costs; extra labor was required as a result of the trend towards removing bones from more cuts and the practice of trimming more of the fat from the cuts in recent years. Improved technology and increases in efficiency by beef packers and processors more than offset increases in costs of labor and other costs, resulting in a declining farm-carcass spread during most of the period.

Seasonal changes in cattle production, marketing and demand for beef caused seasonal variations in beef prices and hence price spreads.

Over a period of several years, fluctuations in beef prices and price spreads tended to follow the cattle cycle inversely.

Random factors were important in causing some short-run movements in the beef prices and spreads. Excess or short supplies, retail price ceiling and unceiling, and labor strike, are but some of the random factors that caused wild swings in prices and price spreads. Random and seasonal factors caused inverse fluctuations between beef prices and price spreads, while cyclical and secular factors caused direct movements between the prices and spreads.