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Estimating weekly and daily hog marketings at interior Iowa and southern Minnesota markets

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ESTIMATING WEEKLY AND DAILY HOG MARKETINGS AT INTERIOR IOWA AND SOUTHERN MINNESOTA MARKETS

by

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I. INTRODUCTION

When a farmer commits a part of his resources to the production of market hogs, eventually he must decide on a time and place to sell them. Most Iowa farmers have several market outlets available to them, including public markets, packing plants, and local buyers. However, deciding on a specific day and place to sell is a problem of major importance to many Iowa hog producers. To make the best marketing decision, complete information is needed on current supply and demand conditions in the alternate market outlets. When there is uncertainty due to the lack of adequate information, marketings may be poorly timed and a loss of income to the hog producer may result. The selection of the time and place to sell hogs may be as important to the outcome of the hog enterprise as any management decision the hog producer has to make.

This thesis is primarily concerned with the supply of hogs. More specifically it deals with weekly and daily market supplies on the Interior Iowa and Southern Minnesota market[1],

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[1]The Interior Iowa and Southern Minnesota Market is commonly referred to as the "Interior", and this designation will be used at times in this thesis. The market supply in this area includes direct sales of hogs made at packing plants located in Iowa and southern Minnesota (excluding those at Sioux City), and sales at country buying points within the Iowa and southern Minnesota area.

and with means to provide hog producers in that market area with advance estimates of short-run supplies.

A. Nature of the Problem

A current weakness of the Interior[1] hog market is that with freedom to choose their market outlet, producers often sell hogs without knowledge of the supply to be marketed at a given time and place. Since the distribution of receipts over time and between markets is primarily responsible for day to day price changes and for changing differentials between markets, this uncertainty of supplies is a problem of major concern to hog producers. Marketings made under these conditions are of a haphazard nature, and obtaining maximum returns on a particular shipment of hogs is often a matter of chance.

Before delineating the specific problem to be considered in this study, a brief look at the general nature of hog marketing may be of value.

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[1]The word "interior" is used in two different contexts within this thesis. When capitalized, it refers specifically to the hog market which is made up of thirteen packing plants and a large number of local buyers and assemblers of hogs on the demand side, all located in Iowa and southern Minnesota, and of many individual hog producers, located in that same area, making up the supply side of the market. The other usage of the word "interior" refers to the geographic area of the Interior market, which includes Iowa and southern Minnesota.

Hogs are not a homogeneous product. There are five market classes of slaughter hogs recognized by the U. S. Department of Agriculture, including barrows, gilts, sows, boars, and stags (1, pp. 278-279). Barrows and gilts normally make up the bulk of the market receipts, although during the late spring and summer months sows usually are a fairly large part of the total market supply of hogs. Within these classes there are many grade and weight differences. For example, United States grade standards classify barrows and gilts as either U.S. No. 1, U.S. No. 2, U.S. No. 3, Medium, or Cull based on such things as degree of finish, estimated yield of lean cuts, and backfat thickness (1, pp. 279-280). Finally, there is considerable variation in the weights of hogs marketed due to individual differences in the production and marketing practices of farmers.

Since there are these class, grade, and weight differences, a discussion in terms of the total supply of hogs sold may not be as specific as desired. However, hog receipt data are normally available only in total amounts, with little or no break-down by type, weight, or grade. In view of this restriction, comment in this study dealing with hog receipts will be in terms of total marketings unless specifically stated otherwise.

Total hog marketings in Iowa and in the United States follow a fairly regular seasonal pattern within the period of

a year, resulting from the heavy concentration of farrowings in the spring and fall months. Thus marketings are normally lightest during June, July, and August and heaviest in November, December, and January. These seasonal variations in the number of hogs sold normally bring about inverse changes in hog prices.

The number of hogs marketed also varies from week to week and day to day. There are many things that affect the number of hogs sold within these periods, including both economic and non-economic factors. For example, some farmers may always sell on a certain day of the week, or when other work is light, or for some other such reason. Others may follow market receipts and prices and make a definite effort to select the best time for selling. However, different interpretations of the market by individual farmers may preclude any uniform response to a given market situation.

The precise effect of these weekly and daily variations in hog receipts on hog prices is not well known. In general it is assumed that weekly and daily prices do change inversely with receipts. It is known that prices do change often from day to day, and an example of the frequency of these changes in the price of hogs should help to illustrate the importance of the marketing decision. A check of daily Interior hog prices for 1955 revealed that the average price of mixed U.S. No. 1 to 3 grade 190-220 pound barrows and gilts

changed from the previous day's average on 230 days of the year, or on 75 per cent of the marketing days.

In addition, prices on a particular weight and grade, or class of hogs may differ between individual market outlets, and the amount of such differentials may change from day to day. The North Central Livestock Marketing Research Committee (2) analyzed price differentials between several terminal and interior markets during the period from 1937-41. They found that the differentials between markets varied between classes and weights of hogs, and that they tended to change from year to year, month to month, and from day to day. The North Central Livestock Marketing Research Committee's (2, p. 74) findings showed that for the period indicated the price differential between Chicago and St. Paul on Good and Choice 200-220 pound barrows and gilts changed on 73 per cent of the marketing days. For the same weight and grade of barrows and gilts, the differential between Chicago and Plant A, located in Iowa, changed on 63 per cent of the market days.

Thompson (3) found that for the period from 1949-54, the average monthly differential on Choice 200-220 pound barrows and gilts between the Interior and Chicago markets ranged from 7 cents above Chicago in February to 92 cents below Chicago in July.

In an earlier study by Thompson (4), daily quotations for all weights of hogs for the year 1936 were analyzed for

two interior plants, Plant M and Plant N, both located in Iowa. It was found that considerable opportunity exists to increase net returns by careful selection of the market outlet. Thus Thompson (4, p. 83) stated:

> In every month of the year, farmers located at approximately equal economic distances from each plant would have found a larger net return by going at one time to packing plant N with good to choice 200-220 pound butchers, and at another time to packing plant M.

These changes in the price differential between markets are caused by unequal changes in supply-demand relationships. Weather conditions may temporarily limit shipments to one market, or on the demand side, unusually large purchases by shippers at one market could strengthen it while other markets were not affected.

It is the short-run price fluctuations from week to week and day to day, combined with price differentials and changes in price differentials between markets on a particular class, grade, and weight of hogs, that create a significant marketing problem. In this study the problem results from price differentials between individual interior markets, between interior markets and the public markets, and between different periods of time.[1] These are related in part to the level of

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[1]For a complete discussion of daily, seasonal, and annual hog price differentials between these markets, see (2, pp. 63-96).

marketings from day to day, and the relative size of supplies at the individual markets on a given day.

The specific problem then is a lack of advance information on the probable supply of hogs to be sold on the Interior market within a week and on a given day. Although information about the future cannot be predicted with complete accuracy, the extent to which it can be appraised reduces the risks assumed by those shipping livestock to the markets. With changes in the general level of hog prices occurring from day to day and week to week, and with differentials between markets on a particular weight and grade of hog constantly changing, the hog producer needs as complete information as possible on expected hog supplies. Advance supply information would tend to eliminate temporary excesses and shortages of receipts and erratic price fluctuations. The present uncertainty of the magnitude of weekly and daily supplies makes it difficult to formulate an estimate of what hogs will bring, and the result may be poorly timed marketings and smaller net returns to the producer.

B. Importance of the Problem

Considering daily and weekly fluctuations in hog prices, plus differentials in price between markets on a particular grade and weight of hog, careful marketing becomes highly important if returns are to be maximized from the hog enter-

prise. The existence of these conditions provides the opportunity for increasing net returns if the decision to sell is made at the right time and place. Complete information on expected weekly and daily marketings would contribute to the knowledge needed to make the best decision.

Maximizing returns from the hog enterprise is especially vital to Iowa farmers. In 1955, 22 per cent of the total United States pig crop was produced in Iowa (5). For the same year, sales of hogs accounted for 34.4 per cent of the cash receipts from agricultural marketings in Iowa (6).

A survey of Iowa farmers made in 1952-53 revealed that 65 per cent of the farmers questioned paid attention to advance estimates of livestock supplies at terminal markets, and that 79 per cent of these felt that the estimates received were accurate most of the time (7). These results indicate that farmers do seek advance estimates of marketings when deciding on the time and place to sell livestock. Estimates on Interior hog supplies, available a day or more in advance, would contribute greatly to the information now available to hog producers.

One other indication of the need for advance information on expected hog marketings on the Interior market is the increase in the number of Iowa hogs sold direct to packing plants and buyers. In 1920, 67.4 per cent of the hogs marketed by Iowa farmers were sold at public markets, with the

balance as direct sales to packing plants and buyers (8). By 1930, only 38.4 per cent were sold at public markets, and by 1951 the number of hogs sold at these markets had dropped to 30.3 per cent of the total. Although comparable data are not available for the years since 1951, there is little reason to believe that a reversal of this trend has occurred or is likely to do so.

C. Purpose of the Study

The purpose of this study is to make an investigation into the use of a weekly index of hog marketings as a means of estimating hog supplies in advance. An attempt will be made to develop a method of estimating in advance the weekly and daily hog supplies to be sold on the Interior market. The construction of a suitable weekly index of Interior hog marketings is therefore a basic part of this study.

It is recognized that there are many factors that affect the number of hogs sold in a short-run situation, and that it is the daily decisions of thousands of hog producers that determine when, how many, and where hogs will be sold. However, no attempt will be made in this study to determine the causes of short-run fluctuations in market supplies.

II. HISTORICAL BACKGROUND OF DAILY LIVESTOCK ESTIMATES

Advance estimates of daily livestock supplies at public markets in the United States probably have been made ever since the markets were established. The early advance estimates were made by agencies and individuals operating on the markets. Later on the U. S. Department of Agriculture assumed its present responsibility for making the daily advance livestock estimates.

A. Estimates by the Trade (9, pp. 2-3)

The three-road report

For many years prior to the establishment of the U. S. Department of Agriculture's livestock market news service in Chicago, estimates of livestock receipts at Chicago were made from the so-called three-road report. Information on probable receipts of livestock was supplied by the three largest carriers of livestock to the Chicago market --- The Chicago Northwestern, The Chicago, Burlington and Quincy, and The Milwaukee and St. Paul railroads. This report gave the total number of cars of all livestock in transit that would reach the market between the close of the trading session on the current day and the following day. Since nearly all livestock moved to market by rail in those days, this gave a fairly good indication of the probable receipts. The main disadvantages were

that no break-down was given by class of livestock, and it was not a complete report since only three railroads were included.

Other trade estimates

Beginning in 1908, estimates were made on Saturday of the number of hogs expected to arrive at Chicago the following Monday and each day during the week. Guesses were made by eight to twenty members of the trade, and their names and establishments published in the Saturday edition of The Chicago Drovers Journal. The arithmetic means of the individual estimates for Monday and the other days of the week, rounded to the nearest thousand, were used as estimates of the market receipts.

B. U. S. Department of Agriculture Estimates (10)

The Federal Market News Service had its beginning in 1915, and released its first livestock market reports from Chicago on June 1, 1918 (10, pp. 172-173). In the early days of the market news service, the only supply information provided was an estimate of total receipts to be unloaded during the day. At that time most of the livestock moving to market passed through public stockyards, and most of it was shipped by rail. With the increase in direct sales by producers to packers, many of the arrivals at public markets went direct

to packers without passing through the yards. As a result, in 1939 the market news service began estimating salable receipts separate from total receipts. Salable receipts include only that part of the total supply to be actually offered for sale, and does not include livestock shipped directly to packing plants located at a particular market point.

Early morning estimates

At the present time daily estimates of supplies of salable cattle, calves, hogs, and sheep are reported by all of the livestock market news offices. These estimates are released around 6:30 a.m. each market day, and include an early morning count of the livestock on hand plus expected arrivals during the trading day. A combined figure on estimated salable receipts at twelve major markets[1] is released from Chicago, along with comparable totals for the same day a week earlier and a year earlier.

Advance daily livestock estimates

For several of the larger midwest markets[2], advance estimates are made of the following day's expected marketings.

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[1]Includes Chicago, Sioux City, Omaha, Kansas City, South St. Joseph, St. Louis National Stockyards, Cincinnati, Denver, Fort Worth, Oklahoma City, Indianapolis, and South St. Paul.

[2]Includes Chicago, Sioux City, Omaha, Kansas City, South St. Joseph, St. Louis National Stockyards, and South St. Paul.

These are released around noon from Monday through Thursday, and are therefore available early enough to influence the marketing plans of livestock shippers.

These advance estimates are based on marketings on the corresponding day of recent weeks, current demand and price trends, weather and road conditions, and similar factors (10, p. 190). Reports from railroads on expected arrivals are also used, although the value of such information has lessened in recent years with the increase in truck shipments of livestock.

Area livestock estimates

Daily estimates of the current day's hog supply are also made for at least three direct marketing areas. These are the Iowa and southern Minnesota area, covered by the Des Moines market news office, the Georgia-Florida-Alabama area, reported by the Thomasville, Georgia office, and the Interior Indiana market, reported by the Muncie, Indiana market news office.

In the Iowa and southern Minnesota area, information is obtained each morning from thirteen packing plants and thirty concentration yards on expected hog receipts. This information is collected and released around mid-morning of the marketing day by the Federal-State Market News Office in Des

Moines. It is the area covered by these daily estimates with which this study is concerned.

III. REPORTS NOW AVAILABLE ON INTERIOR HOG MARKETINGS

There are several reports available to farmers which give some indication of prospective hog supplies on the Interior market. For the most part, this information is of a long-range nature, and is therefore of greater value in adjusting breeding and feeding plans rather than as an aid in making an immediate marketing decision. However, two separate reports are issued which deal directly with expected marketings in the interior area.

A. Daily Estimates of Current Supplies at Interior Markets

On each trading day, the Federal-State Market News Office in Des Moines releases an estimate of total hog marketings expected for that day on the Interior market. These are the only short term estimates of current supplies being made at the present time on Interior hog marketings. Since they are released around mid-morning of the trading day, they are not available in time to be fully effective as an aid in making a marketing decision. Although great improvements in communication have occurred, it is still by no means perfect. Most hog producers rely on radio reports as a source of current market information (11, p. 12). However, since most radio stations do not relay the supply estimates immediately to farmers and buyers, additional time elapses before the information can be used.

The daily estimates as now made include direct sales of hogs to packing plants, order buyers, and out of state shippers. They do not include sales made at any of the public markets. Specifically, the present estimates cover supplies at thirteen interior packing plants[1] and thirty representative concentration yards[2], the latter representing mainly order buyer and shipping concerns. Many of the hogs sold at other buying points end up either in the packing plants or at the concentration yards included in the estimate.

In making these daily estimates, some of the factors considered are the number of hogs received early at the plants and yards contacted, the volume of hogs desired by the buyers, the prices offered, weather and road conditions, and other factors (12). This information is obtained from daily telephone contacts between the market news office and the buyers concerned. The market reporter interprets this information on the basis of his own experience and judgment, and forms an estimate of the current day's hog supply.

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[1]Includes packing plants located at Mason City, Dubuque, Fort Dodge, Des Moines, Storm Lake, Davenport, Ottumwa, Estherville, Marshalltown, Cedar Rapids, and Waterloo in Iowa, and at Austin and Albert Lea in Minnesota.

[2]Concentration yards are operated by packing plants and independent buyers to assemble large numbers of hogs for shipment to packing plants.

B. Monthly Marketing Intentions

Each month a report is issued by the Iowa Cooperative Crop and Livestock Reporting Service on the hog marketing intentions of Iowa farmers for a two month period. This report is released around the twentieth of the month and includes marketing intentions for the current month and the month following. It is not limited to direct sales on the Interior market, but rather is a report of the total hog marketing intentions of Iowa farmers for those months, including sales at public markets.

C. Other Reports

In addition to these reports on expected marketings, the Crop Reporting Board of the Agricultural Marketing Service, U. S. Department of Agriculture, releases several reports giving long-range information on hog supplies. These include semi-annual pig crop reports released in June and December of each year, with the June report being an estimate of the total spring pig crop in the United States, and the December report an estimate of the total fall pig crop. Also available is a quarterly report covering nine of the Cornbelt States, with information on the number of sows farrowed, number and age of hogs on farms, and breeding intentions for later months. For Iowa alone, a report is released each month on the number of sows farrowed. The annual January 1

inventory of livestock numbers gives an estimate of the number and age of hogs on farms in the United States, and similar information for the individual states as well.

IV. REVIEW OF LITERATURE

Very little research has been done in the specific area of improving short-run forecasts of livestock marketings, or of evaluating the existing methods of making such estimates.

Hartnell (13), in discussing daily livestock estimates said:

> To my knowledge no study of the estimates has been made in recent years. The estimating of daily livestock receipts is a problem with which we are immediately and constantly concerned. In the early days of marketing, estimates were based largely upon the reports we were able to obtain on car loadings. Today with modern highways, high speed transportation and radio communication, livestock producers are able to respond almost immediately to what they regard as favorable or unfavorable market information. This producer advantage makes the job of estimating considerably more difficult.

A review of the literature disclosed only one study dealing directly with short-run advance livestock estimates. This was made by Bjorka (9) in 1940, and was primarily an evaluation of the precision[1] of the estimates being made at terminal markets each day. He computed a relative estimating error for each class of livestock by dividing the average daily error by the average daily receipts. Considerable variation was found in the precision of the estimates between days of the week, type of livestock, and between markets.

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[1]The words "precision" and "accuracy" are often used interchangeably in lay discussion. However, in this thesis the words will be used in the context suggested by Cochran (14, p. 10).

In general, cattle receipts were estimated most precisely and sheep least precisely, with the estimating error smallest when receipts were relatively large. Bjorka (9, p. 1) pointed out one of the problems encountered in evaluating estimates of supplies or forecasts of production when he said:

> To the extent that shipments are made, withheld, or shifted among markets in response to estimates, more uniform prices are likely to result at the markets. This response to estimates, however, may cause the disparity between estimates and actual receipts to increase.

Francis (15) studied methods of forecasting hog sales up to three months in advance. His work was based on results of a series of livestock marketing surveys conducted in Iowa and northern Illinois. Although this study was concerned with marketings over a longer period of time, the results and conclusions were of interest and value in developing the present study. The main factors considered as affecting the sales (y_i) during the month (t) were x_1, the number of births at time t-6, x_2, the number of births at time t-7, x_3, the number of births at time t-8, and x_5, the number of sows farrowed at time t-3 plus the number of sows farrowed at t-4. The estimating results obtained were not very satisfactory. Francis observed that (15, p. 55):

> It is somewhat difficult for any mathematical expression, regardless of how complex, to fully sum up the diverse transactions in the marketing of hogs, the decision of any one farmer at a particular time being dependent on such a variety of factors.

Of some importance to this problem is the rather limited amount of work done in developing ways to forecast the annual supply of hogs for the country as a whole. An early study by Elliott (16) analyzed the corn-hog ratio as the primary factor causing changes in hog production.

Schrader (17) used a regression analysis to develop equations for estimating the change in Canadian hog slaughter from the previous year, and the change in the number of sows expected to farrow between December 1 and May 31. For estimating the change in hog slaughter, he obtained a coefficient of correlation of .96, and for estimating the number of sows to farrow, a value of .95 was obtained.

In a more general area, Darcovich and Heady (18) formulated and tested fourteen different expectation models for efficiency of forecasting livestock and crop production and price outcomes. These were models either known to be used by farmers, or others that seemed logical for farmers to use. The magnitude of the forecast error was the criterion of efficiency.

Several evaluation studies have been made dealing with the accuracy of general economic forecasts, notably those by Baker (19) and Heer (20). These are of some interest as far as methods used for testing the accuracy of forecasts are concerned. Baker's study evaluated the skill shown by the federal government in making economic forecasts relating to

agriculture. A similar study by Heer applied a measure to indicate the accuracy of directional farm price predictions published in the Iowa Farm Science Outlook Letter during a specified three-year period. Both studies employed an accuracy score ranging from 0 to 100, with 50 representing the score that theoretically would be obtained if random forecasts were made over a long period of time. Such a method, however, would not be suitable for evaluating the precision of the weekly and daily estimates of hog supplies as developed in this study.

V. THE ANALYTICAL FRAMEWORK

A. The Interior Market Defined

This study is concerned with the direct marketings of hogs on the Iowa and Southern Minnesota market, commonly referred to as the Interior market. This market area is characterized by a heavy concentration of hog production, and by a marketing system under which a large proportion of the hogs produced are sold by the farmer direct to packing plants or buyers. The demand side of the Interior market consists of packing plants, packer country buying stations, order buyers, and shipping interests. Hogs sold at public markets from this area are not a part of the Interior hog trade, and are not considered in this study.

Information on supplies, prices, and market conditions for the Interior market is collected and released daily by the Federal-State Market News Service in Des Moines, Iowa. The collection of this information is a part of the U. S. Department of Agriculture's Livestock Market News Service, and is a cooperative project of the Iowa and U. S. Departments of Agriculture. The market reports released by this office cover sales at thirteen packing plants and thirty concentration yards located within the area[1]. The concentration yards

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[1]Figure 1 shows the geographical location of these packing plants and concentration yards. They are also listed in Appendix A.

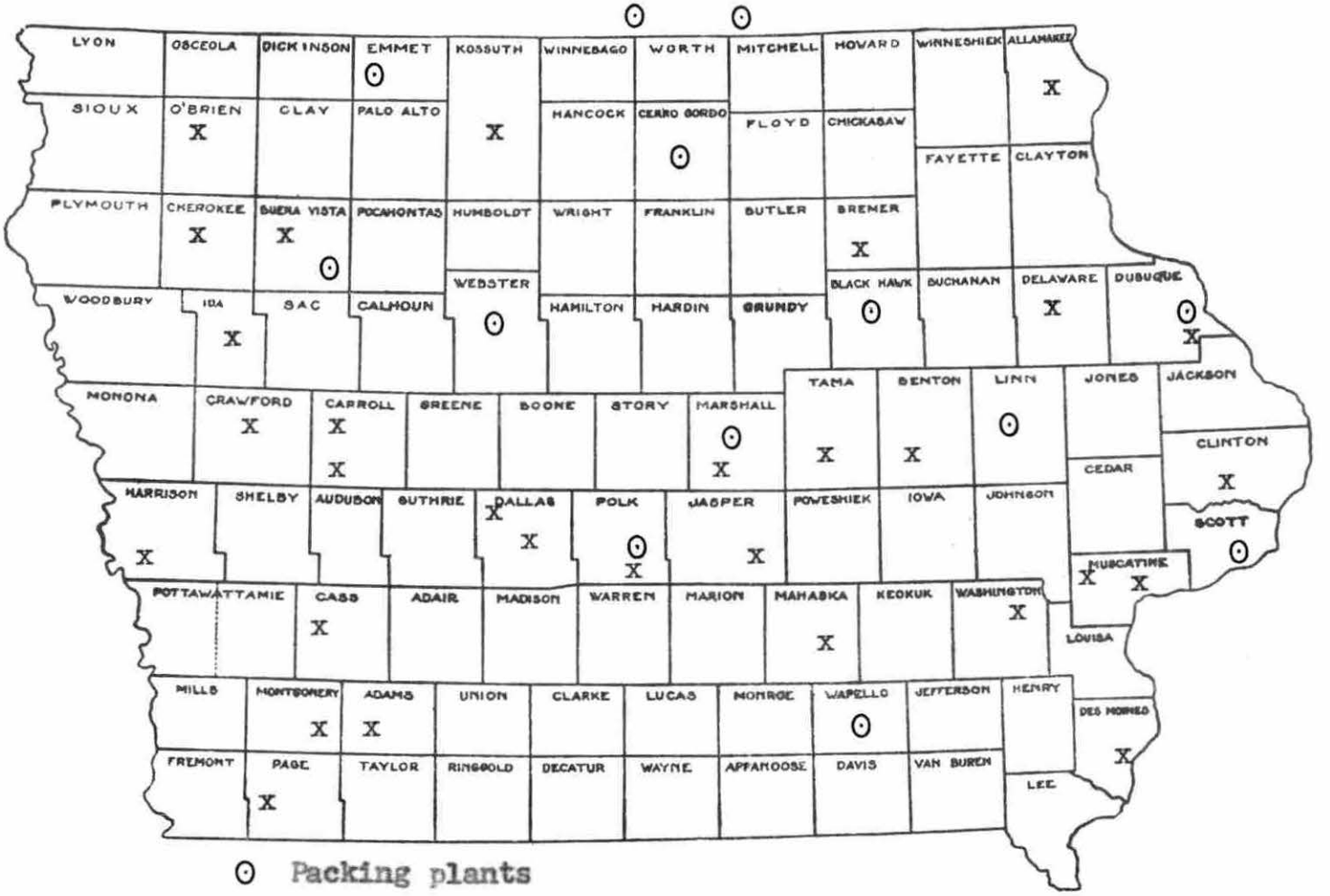

Figure 1. Location of packing plants, and concentration yards included in the Iowa and Southern Minnesota Market Reports

represent order buying and shipping concerns which assemble hogs for movement to packing plants. Sales made at other yards and buying points will, for the most part, eventually end up at either the packing plants or concentration yards covered. Personnel of the Federal-State Market News Office in Des Moines estimate that on an annual basis, sales at these buying points make up roughly 90 per cent of all the hogs sold within the interior area on a direct basis (12). Advance estimates of hog supplies as made in this study will apply to the same market points as are included in the estimates made by the Federal-State Market News Office in Des Moines.

B. Specific Objectives of the Study

The primary objective of this study is to develop a method for making advance estimates of both weekly and daily interior hog supplies that will meet the needs of hog producers as to timeliness and precision of the estimates. This assumes that hog producers would use advance estimates of expected marketings in making marketing plans, and that such estimates would be of greater value to producers if they were available to them in advance of the marketing period. Although this study is specifically concerned with marketings on the Iowa and Southern Minnesota market, the estimating

methods developed should be applicable to other markets and marketing areas where conditions are somewhat similar.

At the present time no estimates of weekly hog marketings are made by the Market News Service of the U. S. Department of Agriculture, the agency which is normally responsible for such estimates. Daily estimates are being made of the expected hog marketings each day on the Iowa and Southern Minnesota market. However, these estimates are not released until mid-morning of the marketing day, which limits their usefulness as an aid in making a marketing decision. Reasonably accurate estimates of both weekly and daily hog supplies, if made in advance of the marketing period, would provide hog producers with additional information from which to make rational marketing decisions. Such information should also be of value to packing plants and other agencies on the buying side of the market in planning their operations.

A second objective is to evaluate the present daily estimates of the current day's supply regarding their value to hog producers and to buyers, and to compare them with advance estimates of supplies as made by the estimating procedure developed in this study. The criteria to be used in comparing the estimating results will be the relative precision of the estimates and the relative timeliness of their availability. To be of greatest value to farmers and buyers, supply

estimates should be available to them in time for consideration in planning buying and selling operations.

An attempt will be made to isolate some of the causes for deviations from the expected seasonal pattern of hog marketings. However, these factors will not be considered directly in making estimates of hog supplies.

C. Hypotheses and Assumptions

The first hypothesis to be tested is that a weekly index of past hog marketings can be effectively used in forecasting probable supplies in advance on a weekly basis. Specifically, this would involve adjusting the past week's actual marketings in the same ratio as the index of marketings changed to arrive at an estimate of the next week's sales.

A second hypothesis is that these weekly estimates of marketings can be sub-divided into estimates of daily marketings on the basis of average proportions of the week's receipts that occur on each day of the week.

These hypotheses are advanced on the basis of two main assumptions. First, that weekly hog marketings follow a fairly regular seasonal pattern from year to year. And secondly, that seasonally the proportion of hogs sold out of the weekly total on each day is fairly uniform.

In addition, it assumes that seasonal, cyclical, and secular factors can be isolated and measured in the construc-

tion of a weekly index of marketings, with allowances therefore made for these factors in making advance estimates. Irregular factors which cause deviations from the weekly and seasonal pattern of marketings will not be considered in making forecasts of marketings. This is necessary because it is believed that there are such a great number of factors that can affect marketings within a given week that it would be impossible, within the scope of this study, to properly analyze their effects. The nature of some of these factors will be discussed, even though their effects will not be quantified. In the practical usage of the estimating method to be presented, any such irregular factors should be considered by the person making estimates or using estimates made by this method.

D. The Theoretical Framework

Any study of an economic problem must have a basis in economic theory. This section sets forth the economic theory involved and relates it to the problem under study. First there is a discussion of the conditions under which agricultural commodities are marketed and their prices determined. The perfect market concept is then suggested as the basic framework needed to analyze the function of supply information in making a marketing decision.

Perfect competition

Many agricultural commodities are produced and marketed under conditions approaching perfect competition. Boulding (21, p. 45) lists these four requirements of a perfectly competitive market: (1) a large number of buyers and sellers, (2) a homogeneous commodity, (3) close contact of buyers and sellers, and (4) no discrimination on the part of buyers. The number of buyers and sellers must be large enough so that the actions of any one of them will not affect the condition of the market. To meet the homogeneity requirement, buyers must have no reason to prefer the product of one seller over another, assuming prices are uniform. Furthermore, buyers and sellers must be aware of the prices at which sales are being made in the market and buyers and sellers must trade freely among themselves.

In practice such a market probably does not exist. However, in general hogs are marketed under conditions near enough to perfect competition to make the comparison useful. There are many buyers and sellers in the aggregate hog market. Although hogs are not completely homogeneous, with widespread use of uniform grade standards, given grades and weights of hogs can be considered as relatively homogeneous items. This means that a buyer would have no reason to prefer a particular weight and grade of hog offered by one seller over those offered by another seller. The development of rapid communica-

tion media has enabled buyers and sellers to keep in close contact with one another, even when they are widely scattered.

In a perfectly competitive market, prices are determined by the willingness of people to buy and sell. This is expressed first as individual demand and supply schedules, which show how much each buyer will take at a given series of prices and how much each seller will put on the market at these prices. The sum of the individual supply curves make up the market supply curve, and the sum of the individual demand curves make up the market demand curve. These show the total quantity buyers will take at each price, and the total supply sellers will make available at each price. The price at which the quantity offered by sellers is the same as the quantity that will be taken by buyers is called the equilibrium price. Thus Marshall (22, p. 345) stated that

> When demand and supply are in equilibrium, the amount of the commodity which is being produced in a unit of time may be called the 'equilibrium amount'; and the price at which it is being sold may be called the 'equilibrium price'.

Such a price represents the intersection point of the market supply and demand schedules for a specific short-run period. Equilibrium prices are not necessarily the same as actual prices at a given time. Since conditions in the market may be constantly changing, new equilibrium prices may be established before actual prices have reached the old equilibrium level.

The perfect market

Since this study is concerned chiefly with the supply information needed by Iowa farmers in making their hog marketing decisions, the perfect market concept is the most logical theoretical setting. Economists define a market in several different ways. Marshall (22, p. 324) said:

> When demand and supply are spoken of in relation to one another it is of course necessary that the market to which they refer should be the same. As Cournot says, 'Economists understand by the term Market, not any particular market place in which things are bought and sold, but the whole of any region in which buyers and sellers are in such free intercourse with one another that the price of the same goods tend to equality easily and quickly.'

This definition of a market was given by Shepherd (23, p. 17):

> A market is a group of men (or women), a group of buyers or sellers with facilities for trading with each other. They may be gathered together at one point, or in one market place, or scattered over a large area--that is only incidental. The important thing which defines a market is the closeness of the communication between the men in it.

Additional conditions must be fulfilled before a market can be considered a perfect market. In such a market all of the buyers and sellers in it have complete knowledge of demand, supply, and prices. The commodity concerned is homogeneous, or capable of being uniformly classified within prescribed grade standards. A third requirement is that a uniform price prevail, plus or minus transportation, handling, storage, and processing costs between buyers and sellers

in different parts of the market. As Marshall (22, p. 112) said:

> A perfect market is a district, small or large, in which many buyers and many sellers all so keenly on the alert and so well acquainted with one another's affairs that the price of a commodity is always practically the same for the whole of the district.

Structural definition of the Interior hog market

A structural definition of the Interior hog market can be achieved by examining the Interior market in terms of the perfect market concept. The performance of the market is determined by the supply side of the market, represented by sellers of hogs, and by the demand side, which is represented at the primary level by hog buyers.

The sellers in the Interior market consist of many individual hog producers located throughout the interior area. A hog producer can be considered as a seller in the Interior market only if his hogs are transferred by direct negotiation between himself and the buyer. Hogs from the interior area that are consigned to a commission firm and sold at a public market are not a part of the Interior market. An aggregation of the hogs offered for sale by sellers at all direct buying points within the interior area in a specified period of time makes up the Interior market supply of hogs for that period.

Many factors affect the supply of hogs offered by sellers in a particular period of time. Basically, current supplies

are determined by the number of pigs farrowed in preceding months by hog producers. Short-run factors include the price offered for hogs by buyers at a specific time, weather conditions, feed supplies, and others. Some hog producers may evaluate market conditions, and then formulate current and future price expectations for their particular supply of hogs. On the basis of these price expectations a decision is made to sell or to wait. Other hog producers may make marketing decisions on the basis of habit or convenience, without considering current market factors. Individual hog producers are likely to react differently to a particular market situation, and this prevents a uniform response to a given condition.

The buyers in the Interior market are basically the packing plants located within the interior area, and other packing plants located outside the interior area who procure hogs for shipment to their plants. The actual buying may take place at the packing plants themselves, at packer-owned buying stations located in the country, or at buying stations operated by independent dealers and order buyers who assemble hogs for resale and shipment to packing plants. The aggregate actions of these buyers reflect the demand side of the Interior market.

The demand for live hogs is determined by the consumer demand for pork products, although at the packer level demand

conditions are observed through contact with the wholesale pork market. Consumer demand for pork is affected by many factors such as relative supplies of other kinds of meat, religious beliefs, tastes, seasons of the year, and the weather. However, the most important factor affecting the demand for pork is the net incomes of consumers. The total demand for pork probably changes slowly since the income of most consumers is nearly the same from month to month. However, within individual markets, there may be frequent changes in the short-run demand for pork which will affect the price-quantity relationships in that market.

The price of hogs on the Interior market at a specific time is determined by the interaction of the various supply and demand factors present. Knowledge of the relative effects of each factor on the price-quantity relationship at a specific time would put buyers and sellers in a better position to increase their net returns. The actual price determining process for hogs is divided into two parts. First the value of "hogs" at that particular time and location must be determined, and then the value of a specific shipment of hogs must be determined, relative to other hogs offered. The second step is necessary because of weight and grade differences in hogs which are concealed when average prices of hogs are considered.

With this description of the structure of the Interior hog market as a guide, we can now examine the market for pos-

sible imperfections in terms of the perfect market concept. Although there are many buyers and sellers in the Interior market, it fails to meet other requirements of a perfect market. Some of these imperfections will be noted.

Nature of imperfections in the Interior hog market

In a market where all buyers and sellers are trading at a single location, with prices and other information posted where all can see it, the requirements of the perfect market may be approached or met. However, some imperfections are likely to be present both at public markets and in decentralized markets such as the Interior.

First, there is often a lack of knowledge on the part of buyers and sellers with respect to current demand, supply, and price conditions. The development of communication media such as radio and television has provided the physical means to make information quickly available to all buyers and sellers in a decentralized market. Much progress has been made in the collection and dissemination of current market information. However, there are other types of information not now available to buyers and sellers which would contribute to their knowledge of market conditions. Furthermore, much of the market information now collected is not relayed to farmers in time to benefit them in their marketing decisions. In a direct marketing area such as the interior, most hog producers

are within a relatively short distance of one or several buying points. To be of greatest value in deciding whether or not to sell on a specific day, market information needs to be available during the morning hours. Historically most radio stations have broadcast market information very early in the morning when little current information is available, or during the noon hour when such information is too late to be of maximum value.

One area in which there is incomplete knowledge in the Interior market is with respect to probable weekly and daily hog supplies. At the present time an estimate of the day's hog supply on the Interior market is released about mid-morning of each trading day by the Federal-State Market News Office in Des Moines, Iowa. Due to the time normally required to arrange transportation and to move hogs to market once the decision to sell has been made, supply estimates released at mid-morning are not fully effective as an aid to farmers and buyers. To be most effective within the limits of its precision, such information should be available at least throughout the marketing day, and preferably a day or more in advance.

No estimates of expected weekly Interior hog marketings are available to Iowa hog producers at the present time. The availability of such supply information would also contribute to the overall understanding of market conditions.

Since all hogs are not the same, an added area of imperfection is created by the inability of producers to correctly relate hog grades to their own product. Thus, even when market information is received by the producer in terms of specific weights and grades of hogs, he is faced with the problem of estimating the grade and weight of his own hogs in formulating a price expectation. Therefore, lack of ability and differences in the ability of individual hog producers to grade their hogs tends to prevent the attainment of perfect market conditions.

Hog producers may not fully utilize the information available to them for various reasons. Custom or habit may control their marketing. For example, some hog producers may always sell on a certain day of the week regardless of market conditions. Others may always sell to the same market without considering alternate outlets for their product. Irregular or unexpected happenings such as bad weather, bad roads, disruptions in communication service, or labor difficulties may also affect the marketing system. The resulting uncertainties create added imperfections in the market.

Under some conditions producers may be unable to sell at a particular time or place, even though market conditions appear favorable. The irregular factors just mentioned may prevent marketing. In addition, other farm jobs may conflict with marketing, in which case the farmer must decide which

is economically more important. Still another limitation to successful marketing of hogs may be due to small numbers of hogs ready for market at a given time. Transportation to the most favorable market may prove uneconomical for small shipments.

In a perfect market prices are uniform throughout the area of the market. In the Interior market a lack of advance supply information, combined with uncertainties about other market conditions, is likely to result in price differences that cannot be accounted for by transportation, handling, storage, and processing costs between buyers and sellers in different parts of the market.

Possible improvements from advance estimates of Interior hog supplies

Maximization of net returns is the objective of the buyers and sellers in the Interior hog market. Advance estimates of weekly and daily Interior market supplies should put buyers and sellers in a better position to maximize their returns.

On the buying side, packers need to estimate what the commercial slaughter will be in order to make their work plans for the coming week. Knowledge of advance estimates of weekly supplies on the Interior market would be an intermediate step in the estimation of hog slaughter. The availability of fairly precise estimates of weekly Interior hog supplies

should enable packers to do a better job of planning their buying and distribution operations, and result in greater plant efficiency.

On the supply side of the market, hog producers are interested in what the price of hogs will be on the Interior market the following week. Short-run advance estimates of Interior hog supplies would be of value to hog producers only if they could be used in forming a price expectation for hogs that could be sold during the period covered by the estimate. Survey results have indicated that Iowa farmers do consider advance livestock estimates at terminal markets when deciding when and where to sell livestock (7). This would indicate that farmers are now making some form of price-quantity interpretation of this advance supply information. These price expectations are probably made in very general and relative terms. They may be of the form; "somewhat higher" prices are expected when the advance estimate is for "smaller" receipts, and "somewhat lower" prices are expected when the advance estimate is for "larger" receipts. Price expectations formed in this manner would be highly uncertain, but are apparently of some value to hog producers. Therefore, advance short-run estimates of Interior hog supplies could be used within the same framework of interpretation that is applied to other supply estimates.

However, for advance supply estimates to be of maximum value to hog producers, more definite relationships need to be established between short-run changes in hog supplies and hog prices. Changes in demand are also relevant in predicting prices. Therefore, some knowledge of short-run changes in demand would be necessary. This would require a recognition of the factors affecting the demand for hogs on the Interior market, as well as a rather thorough understanding of the effect changes in these demand factors have on the price of hogs. Knowledge is presently lacking in regard to the specific relationship between short-run changes in supplies and prices of hogs, and in regard to short-run changes in demand factors and the price of hogs. Further research is needed in these areas before advance estimates of short-run supplies of hogs can be used to formulate specific price expectations.

Both the supply and demand sides of the Interior hog market should benefit from advance estimates of short-run supplies in several other ways. Hog marketings should show more stability from week to week, and the chance of sharp price fluctuations should be lessened. The overall efficiency of the marketing process should be improved, and some of the uncertainty present in the market should be eliminated.

Application of an index method of estimating hog supplies

In this study, a weekly index of past marketings is tested as a method of making advance estimates of Interior hog supplies. To be successful in its purpose, an index method of making estimates requires that relatively stable relationships exist in the market. Any change in the structure of the market would affect this stability. Changes in the market structure could conceivably result from widespread acceptance of the estimating method, or changes could be due to other causes. Thus, to keep abreast of changes in the market structure the index used in estimating hog supplies might require periodic revision. This is not believed to be a serious weakness of the index method, however, since most forecasting methods are subject to similar limitations.

VI. METHOD OF PROCEDURE

A. Source of Data

The original data used in this thesis were obtained from reports issued by the Livestock Division of the Federal Market News Service of the U. S. Department of Agriculture. The data on weekly Interior hog marketings, used in the construction of the weekly index of marketings and in evaluating the weekly estimates, were obtained from the weekly statistical publication, "Market News, Livestock Division" (24). Information on actual daily Interior hog marketings and U. S. Department of Agriculture estimates of daily Interior hog marketings was obtained from teletype reports received at the market news room of radio station WOI in Ames, Iowa. These reports were compiled by the Federal-State Market News Service in Des Moines, Iowa.

B. Construction of the Weekly Index

A basic and preliminary part of this study was the development of a weekly seasonal index of Interior hog marketings to be used in making supply forecasts. Fluctuations in hog marketings over time may be due to several factors. In the study of time series, these fluctuations have been classified as seasonal, cyclical, secular, or irregular in nature, with the latter including such things as weather conditions,

governmental action, and other less predictable occurrences. In developing a seasonal index from a time series, the problem is to isolate that part of the fluctuation that is mainly seasonal in nature. The measurement of regular seasonal variation can be accomplished by several different methods. Each method has certain features which makes its use preferable in some types of problems. Differences in the results obtained from the various methods are often small, however.

The method used in developing a weekly index of hog marketings in this study was adapted from one recommended by Foote and Fox (25) for measuring seasonal variation from monthly data. It is basically the ratio to moving average method. Since a weekly index was required in this study, it was necessary to adapt the procedure to fit weekly data rather than the more commonly used monthly data. However, the basic procedure was not changed. Weekly data on Interior hog marketings for the years 1948 through 1956 were used in constructing the seasonal index.

Using consecutive weekly data, the following steps were used:

1. A 52-week moving total of the data was computed, with the first total entered opposite the 26th week.

2. These totals were divided by 52 to obtain a centered 52-week moving average[1].

3. Ratios were computed by dividing the original data by the centered moving average for the same week, and multiplying by 100.

4. The ratios for all years available were plotted against time in a series of charts, using a separate chart for each week. (Visual inspection of these charts usually will indicate whether the degree of seasonal variation is significant and whether it has changed during the period of time studied. If most of the values for a given week are consistently above or below the 100 line by a fairly uniform amount for all years, it can be assumed that a seasonal pattern prevails and that it has not changed significantly during the period. If a change in the seasonal pattern is indicated, additional adjustments will be necessary. These will be mentioned later.)

5. The arithmetic mean of the ratios for each week for all years was computed[2]. (Sometimes individual ratios are

[1]Foote and Fox (25) suggested taking the average of two 12-month moving totals to obtain a properly centered moving average from monthly data. This step was omitted when weekly data were used because of the large number of items included in each total. The bias introduced by this omission is not believed to be serious.

[2]There was considerable variation in the degree of uniformity of ratios within individual weeks. The standard deviations of the ratios from the moving average and the standard errors of the individual weekly indexes are shown in Appendix B.

omitted if special circumstances caused an abnormal value.)

6. The 52 weekly means were adjusted so that their average equaled 100 by multiplying each by the appropriate factor. This factor was obtained by dividing 100 by the average of the weekly ratios.

Ordinarily the series obtained at this point would represent the final index of seasonal variation. However, in this study an analysis of the results obtained in step 4 indicated that a significant change in the seasonal marketing pattern had occurred during some periods of the year. As a result the seasonal index as obtained in step 6 required additional adjustment to allow for the trend observed.

Adjustment for trend

Since the pattern of seasonal variation had changed, it was necessary to adjust the original index to estimate the seasonal pattern for specific years[1]. To do this, the statistical method of simple regression was employed[2]. A regres-

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[1]Foote and Fox (25) sets forth the conditions under which adjustment for trend is necessary, and also discusses the uses of seasonal index numbers.

[2]Regression methods are described in many books including those by Snedecor (26), Ostle (27), and others.

sion was computed for each week, measuring the effect of time on the individual weekly index numbers or ratios. Since the relationship appeared to be linear from graphical examination of the plotted data, it was assumed that unit changes in the independent variable, time, would be accompanied by proportional changes in the dependent variable, which was the weekly index number. The relationship was represented by a prediction equation of the form $Y = \bar{y} + b(T-\bar{T})$, where Y is the predicted index number; T is the independent variable, time, and $\bar{y}$ and b are variables obtained from the regression analysis. Data for the nine years 1948 through 1956 were used in constructing the original index. The variable, T, is therefore the number of the year as it appears in the time series. Thus the value of T for the year 1948 would be one, and for the year 1956 it would be nine. $\bar{T}$ is the mean value of the nine years and its value is always five. The variable, b, represents the slope of the regression line and $\bar{y}$ is the Y-intercept, which is the mean value of the individual weekly ratios.

A prediction equation of this type was developed for each week of the year, even though the regression was not significant for all weeks. This was necessary since the final weekly index had to total 5200, thus averaging to 100 per week. Adjusting only the weeks in which the regression was significant left the index unbalanced. Regression coefficients and R^2 values for the individual weekly regression

equations are shown in Table 1. Notice that the change in the pattern of seasonal variation in marketings was concentrated mainly in the summer and fall periods. This apparently resulted partly from the trend toward earlier farrowings of spring pigs as well as a tendency to market hogs at a younger age. Some shift was also observed in the pattern of marketings during the winter and spring periods. These changes are shown in Figure 2 where mean ratios for the years 1948 through 1951 are compared with weekly mean ratios for the years from 1952 through 1956[1].

The original index numbers obtained in step 6 were adjusted according to the prediction equation and method just described to obtain estimates of the weekly index of marketings for the years 1955, 1956, and 1957[2]. Figure 3 illustrates the seasonal pattern of marketings as developed from the nine years of weekly data, and the predicted seasonal pattern for 1957.

C. Procedure for Making Weekly Estimates

A two-step procedure was used in making weekly estimates of Interior hog supplies. The basic factor used in making

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[1]Also see Appendix B.

[2]Estimated indexes for these years are shown in Appendix B.

Table 1. Regression coefficients and R^2 values obtained for individual weekly indexes for the purpose of adjusting the seasonal index of Interior hog marketings for future years

Week	Regression coefficient	R^2[a]		Week	Regression coefficient	R^2[a]	
1	-2.53	.2219		27	-1.90	.3665	
2	-1.82	.2099		28	-2.38	.5648	*
3	-4.65	.7780	*	29	-1.90	.4483	*
4	-1.48	.0811		30	-1.58	.3497	
5	-2.83	.3190		31	- .38	.0865	
6	-2.63	.1189		32	.85	.1080	
7	-1.95	.1532		33	3.23	.7060	*
8	.93	.0901		34	2.82	.5800	*
9	2.03	.1771		35	3.95	.8730	*
10	.65	.0141		36	5.03	.7840	*
11	1.73	.1948		37	4.60	.5113	*
12	2.80	.6510	*	38	4.73	.6715	*
13	2.38	.1785		39	4.85	.6310	*
14	3.07	.4896	*	40	3.95	.5064	*
15	1.33	.1507		41	5.08	.8323	*
16	.78	.0613		42	1.93	.2110	
17	1.18	.0727		43	2.78	.3359	
18	.38	.0192		44	3.08	.3475	
19	1.55	.1925		45	1.42	.0384	
20	-1.60	.2337		46	.13	.0009	
21	- .52	.0485		47	-4.50	.2970	
22	-3.28	.8870	*	48	-1.52	.0960	
23	-3.83	.4540	*	49	-5.58	.6101	*
24	-3.80	.3800		50	-2.08	.2407	
25	-3.88	.8740	*	51	-3.78	.5296	*
26	- .98	.0855		52	.53	.1458	

[a]If the assumption of independence of consecutive deviations from the regression line is made, then the 5 per cent significance level for R^2, when $n = 9$, is .4436. The 1 per cent significance level is .6368. R^2 values significant at the 5 per cent level are followed by an asterisk (*).

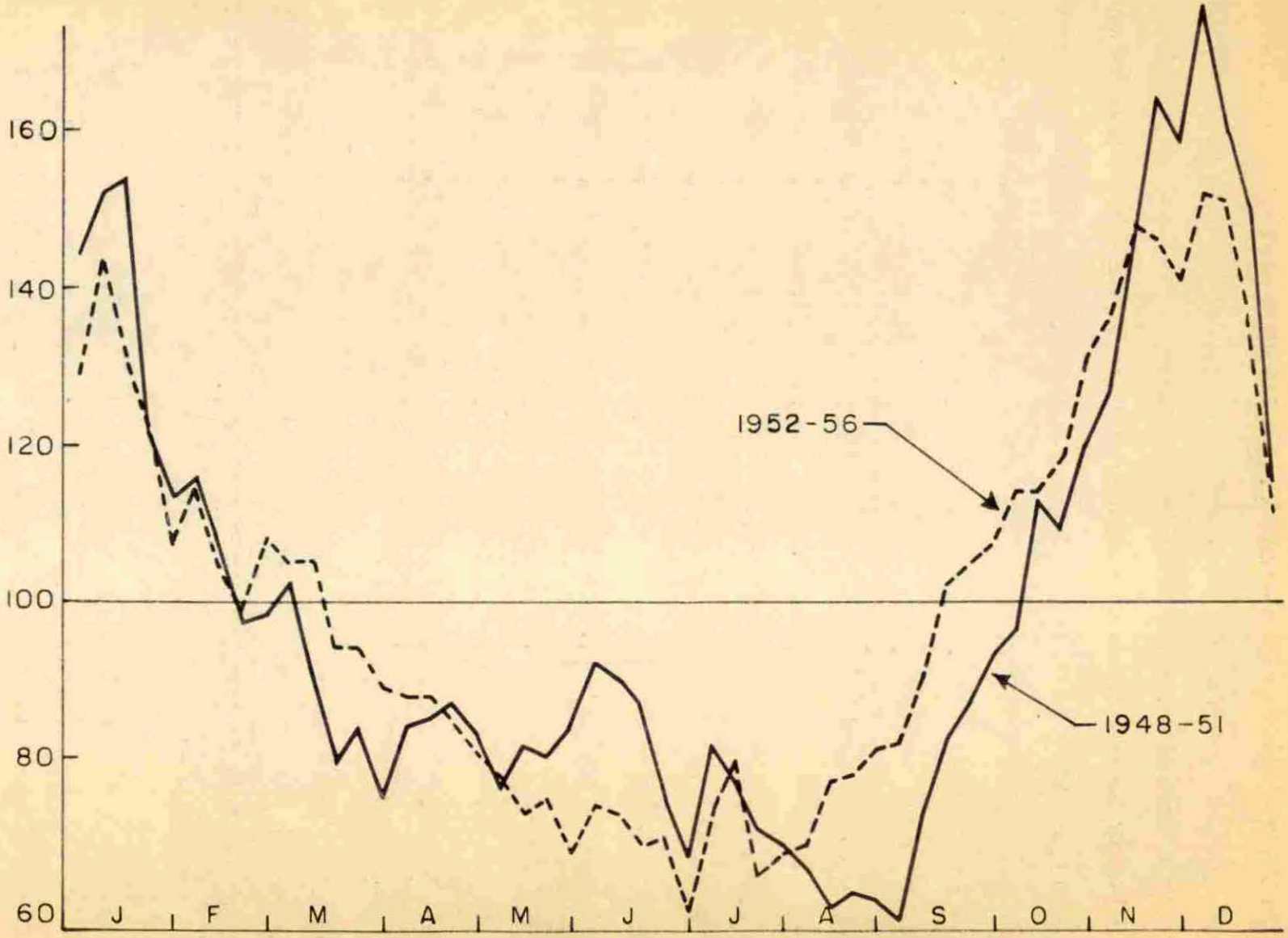

Figure 2. Weekly index of Interior hog marketings

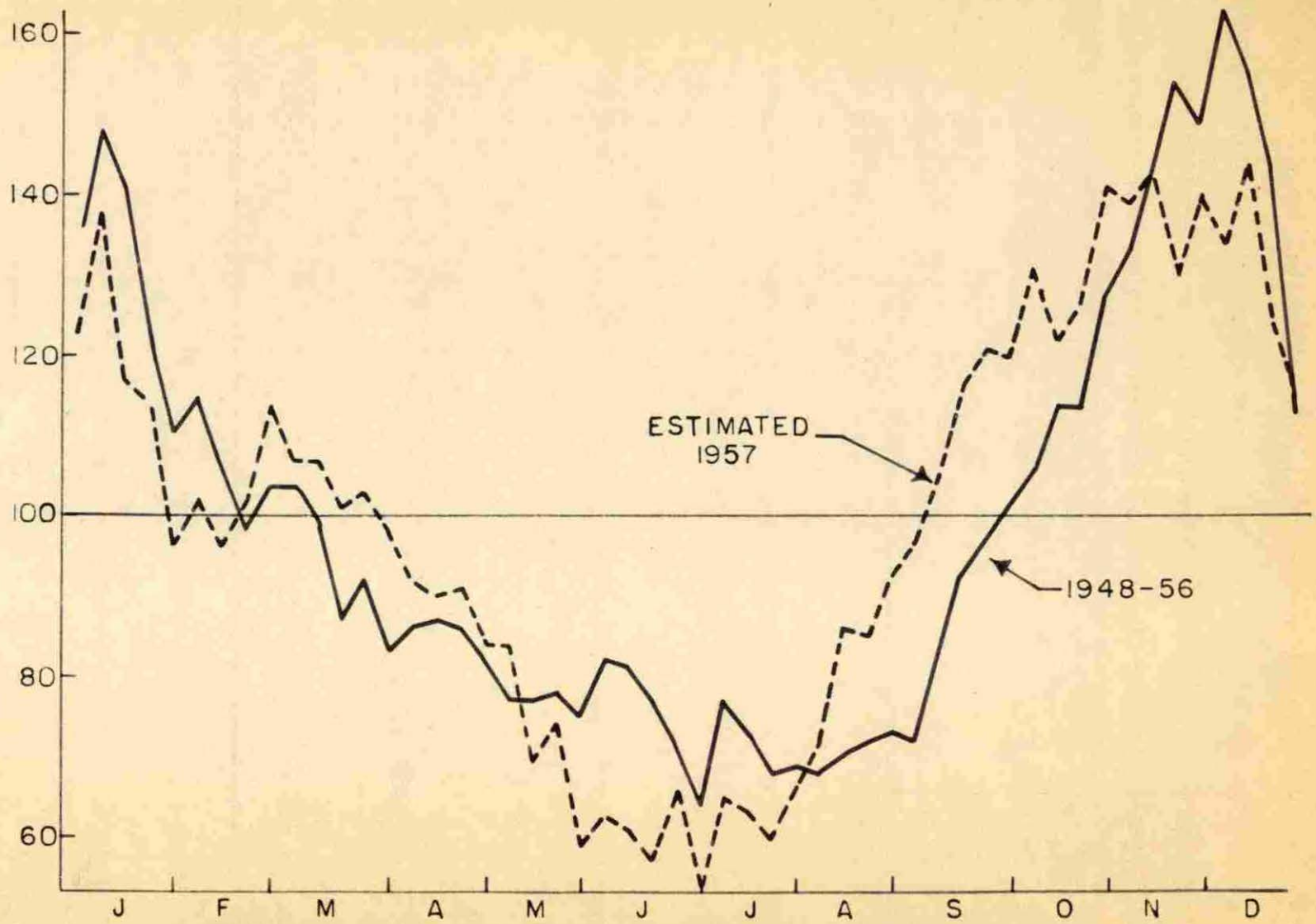

Figure 3. Weekly index of Interior hog marketings

the advance estimates was the previous week's actual sales. This quantity was adjusted in the same ratio as the change in the index of marketings between the two weeks. This can be expressed by the formula

$$M_{t+1} = M_t\left(\frac{I_{t+1}}{I_t}\right), \quad \text{where}$$

M_{t+1} = the estimate of supplies the following week,

M_t = the past week's actual hog supplies,

I_{t+1} = the weekly index of marketings for the following week, and

I_t = the weekly index of marketings for the past week.

Using this procedure, preliminary estimates were made of weekly supplies for the years 1955 and 1956. This was the first step in the estimating process used.

In an effort to improve the precision of the estimates, the statistical method of regression was again employed. Using the preliminary estimates for 1955 and 1956 as a sample, a simple regression was computed to determine the relationship between these estimates, X_1, and the actual marketings, Y_1. The regression equation thus developed for making final advance estimates of weekly Interior hog supplies was of the form $Y = a + bX_1$, where Y is the revised estimate of weekly hog supplies in the Interior, X_1 is the original or preliminary estimate of supplies, and a and b are the constants obtained from the regression analysis. The constant, b, is

the regression coefficient which represents the slope of the regression line, while the constant, a, is the Y-intercept. The unit of measure for Y, X_1, and the constant, a, is thousands of hogs. The prediction equation which resulted was $Y = 20.17 + .9384X_1$. Final estimates of weekly marketings were made from this equation[1].

Adjustment factor

Even with the preceding regression equation adjustment, there were still a number of large errors. Many of the original estimating errors appeared to be due to large deviations of actual marketings in the base week from the expected seasonal pattern. Thus, a large forecasting error in one week was often followed by a large error in the opposite direction in the following week. However, when the relationship of one week's error to that of the following week was studied by computing a simple lag correlation, lag one week, the result obtained was .09. This seemed to be of no practical value as a basis for further adjustment by some regression procedure. Despite this, some adjustment appeared advisable under certain conditions. Therefore the following adjustment factor was developed: When the error in estimating the hog supply

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[1] R^2 for the regression equation was .9116.

was equal to or greater than 10 per cent of the actual marketings, the base figure for making the next week's estimate was the previous week's estimated supply rather than the actual marketings in that week. The basis for this judgment adjustment lies in the belief that weeks affected by irregular factors, or otherwise showing extreme deviations from the expected outcome, do not provide a suitable base for making the next week's estimate. One restriction was placed on the use of this adjustment. When a large error persisted in the same direction for two or more consecutive weeks, no adjustment was made after the initial week. This restriction was based on the belief that a persistent estimating error in the same direction would indicate a shift to a different level of marketings. A specific example will illustrate the use of this adjustment factor. For the nineteenth week of 1956, the Interior hog supply was estimated at 341,000 head, which was 60,000 above the actual marketings. Since the estimating error exceeded 10 per cent of the actual supply, 341,000 was used as the base for the next week's estimate. However, for the twentieth week supplies were again greatly overestimated. As a result, estimates for the following week were based on actual marketings in the twentieth week even though the error in that week had exceeded the 10 per cent limit.

Estimate for holiday weeks

In some cases, floating holidays made it necessary to change the regular estimating procedure. Holidays that fell on the same day of the month each year, such as the Fourth of July, did not create a problem since the weekly index of marketings had already accounted for their occurrence.

In estimating supplies for the weeks in which the Labor Day and Thanksgiving holidays occurred, the following procedure was followed: No adjustment was made if the holiday occurred on Monday, Tuesday, or Wednesday since it was believed that larger marketings on the remaining days of the week would off-set the lack of marketings on the holiday. If the holiday occurred on Friday or Saturday, the estimate was adjusted downward by the formula $Y^* = Y - \frac{1}{2}\frac{(Y)}{6}$, where Y^* is the adjusted estimate of weekly supplies and Y is the estimate obtained by the regular method. Since there are six marketing days in the week, $\frac{Y}{6}$ is an estimate of the average daily marketings for the week. The estimate of weekly supplies was reduced by one-half this amount. This arbitrary adjustment seemed reasonable to the author because Saturday supplies are normally much smaller than for other days of the week. Furthermore, it was observed that for Friday holidays the lack of marketings was only partly off-set by larger supplies on the Saturday that followed.

D. Estimating Daily Hog Marketings

Estimates of daily hog supplies were derived from the weekly estimates by a simple procedure. First of all, using data on daily and weekly Interior hog marketings for the years 1953 through 1956, the proportion of each week's supply occurring on each day was determined. Thus four percentage values were obtained for each day of each week in the period. The mean of each set of four values was used as an estimator in making forecasts of supplies for that day[1]. To estimate daily supplies in a specific week, the average proportions of daily marketings for that week were applied to the estimate of weekly supplies made previously. Monthly and quarterly aggregation of these daily proportions was tested, but this did not improve the estimating results.

Weeks in which holidays occurred required special attention. For holidays that fell on the same day of the week each year, such as Labor Day and Thanksgiving, the average proportions from the original data were used in the manner already described. For holidays that occurred on different days from year to year, only the proportions for years when the holiday was on a comparable day were used in computing the mean proportions.

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[1]The daily proportions used for each week are shown in Appendix C.

VII. ANALYSIS OF DATA AND RESULTS

This chapter presents a summary of the results obtained in this study. Section A sets forth and analyzes the results obtained in estimating weekly hog supplies on the Interior market. Section B presents the results obtained in estimating daily Interior hog supplies.

A. Weekly Estimates of Interior Hog Marketings

Using the procedure outlined in Chapter VI, estimates were made of weekly Interior hog supplies for the years 1955, 1956, and for the first half of 1957. It is recognized that the estimates made for 1955 and 1956 are not true forecasts, since data on marketings for those years were included in the original data used in developing a weekly index of Interior marketings. However, the specific indexes of marketings used for estimating supplies in those years were based on the full nine years of data and were estimated by the method previously described. Therefore, the precision of the estimates for those two years was not expected to be affected greatly one way or the other.

Figures 4, 5, and 6 show the actual and estimated hog marketings for the three periods tested. This information, along with the individual estimating errors, is also listed in tabular form in Appendix D. The deviations of the estimated weekly hog marketings from the actual sales were meas-

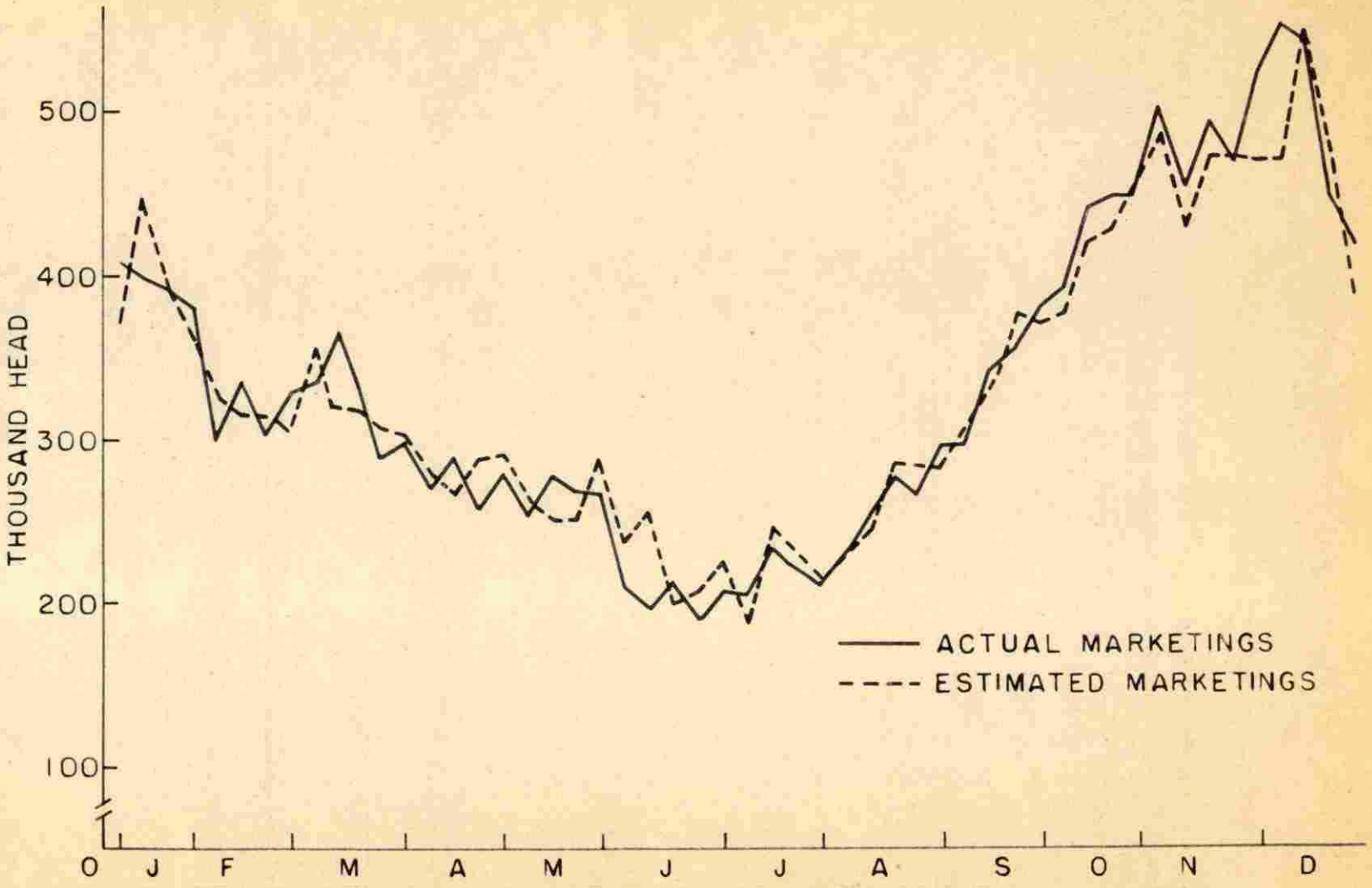

Figure 4. Weekly Interior hog marketings for the year 1955

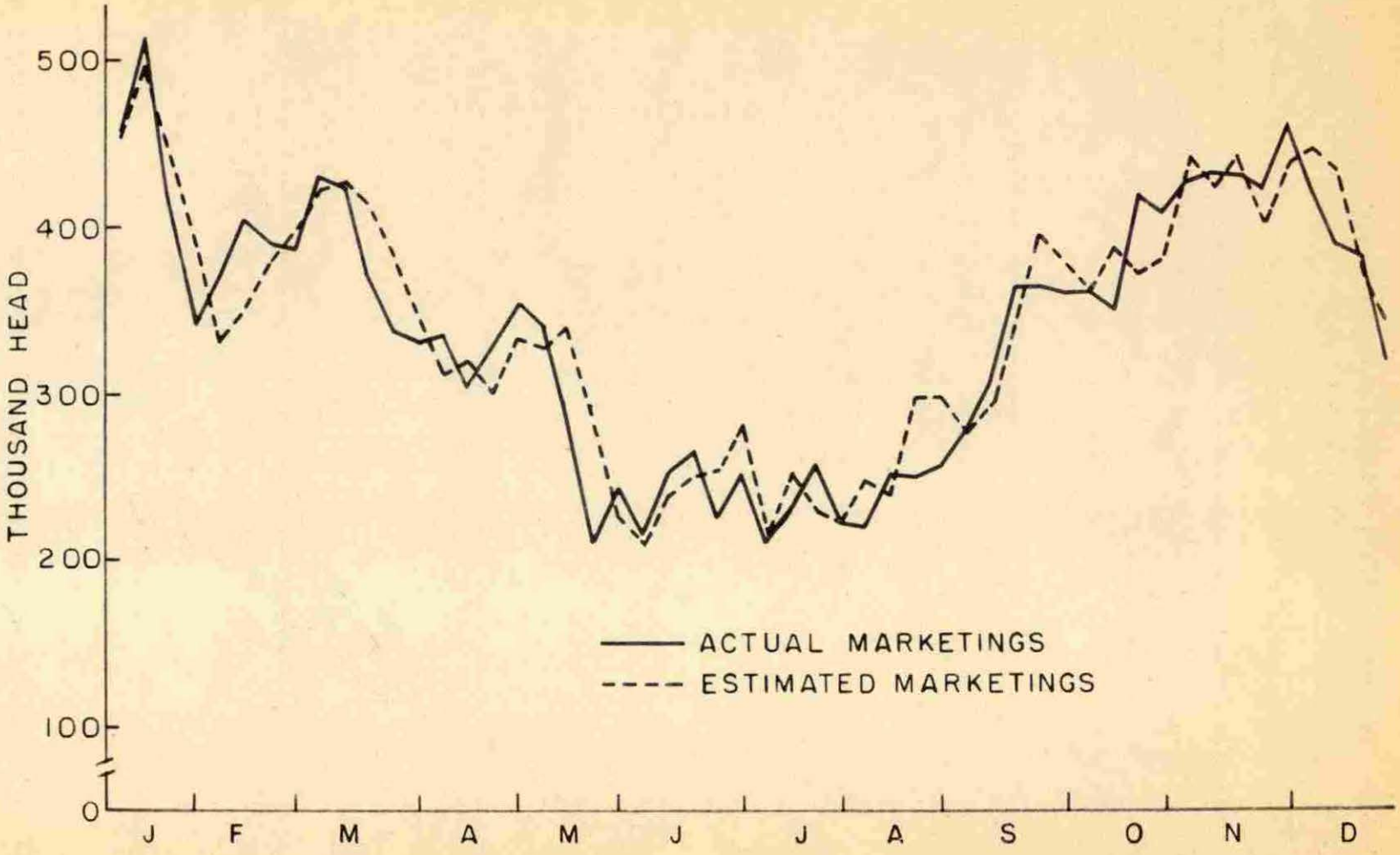

Figure 5. Weekly Interior hog marketings for the year 1956

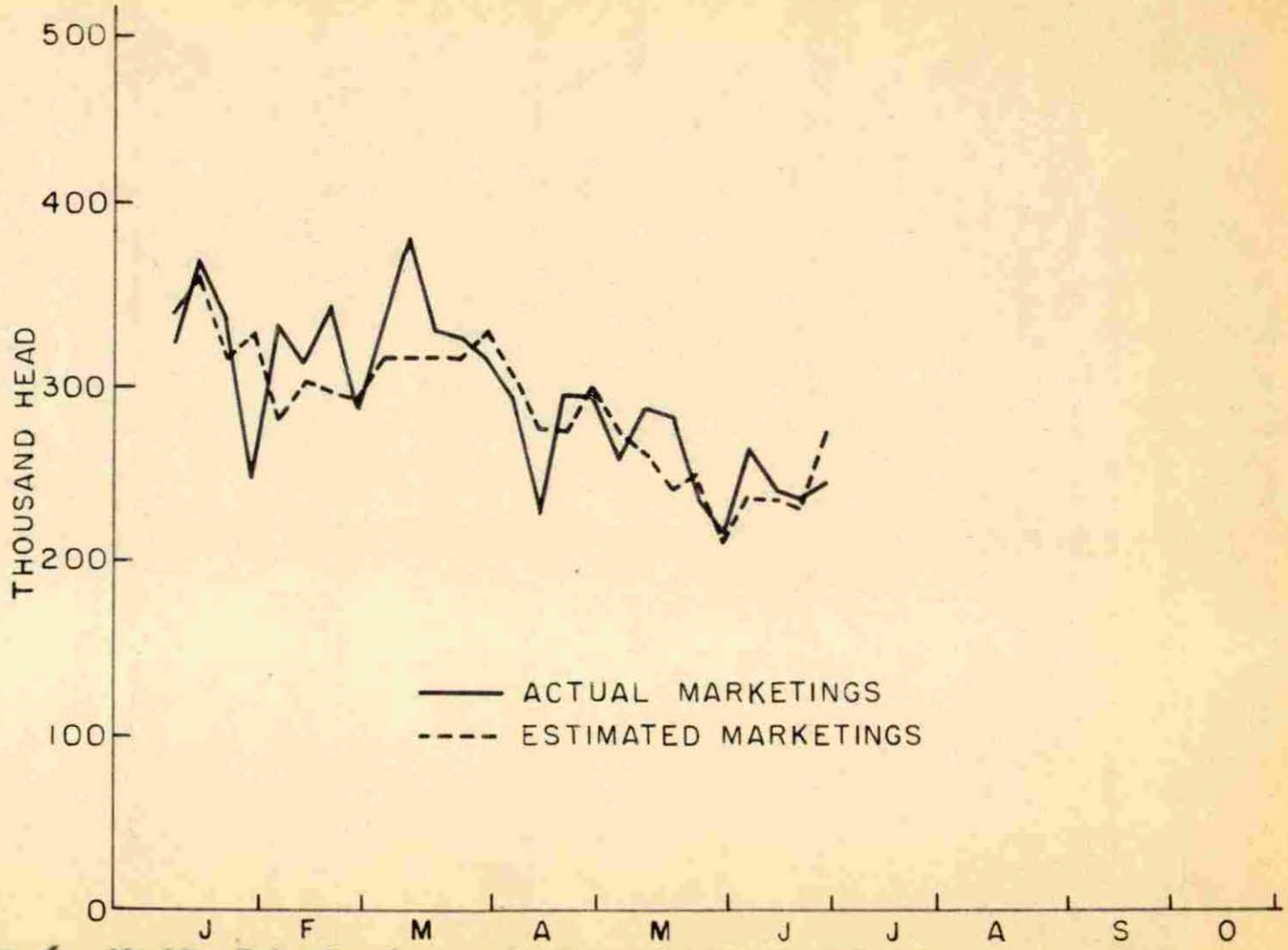

Figure 6. Weekly Interior hog marketings for the period January through June, 1957

ured and the standard deviations of the errors of the estimate computed for each year. These standard deviations, s, were obtained by applying the formula

$$s = \sqrt{\frac{\Sigma(Y - \hat{Y})^2}{N}} ,$$

where Y is the actual supply; $\hat{Y}$ is the estimate of supplies; and N = 52, the number of deviations computed for each year[1]. The average estimating error in absolute terms is also presented as an alternate measure of the estimating precision. These results are summarized in Table 2. In each of the periods for which estimates were made, a relatively large

Table 2. Weekly Interior hog marketings: Standard deviations of the errors of the estimates, and average absolute deviations of the estimates

Year[a]	Average weekly marketings	Standard deviations of the errors of the estimates	Average absolute deviation of the estimate
1955	333,500	25,400	20,300
1956	338,800	30,000	24,900
1957	290,300	32,600	25,000

[a]Includes only the first six months of 1957.

[1]These standard deviations are actually a root mean square of the deviations of the estimates. Since these deviations form a time series, the exact degrees of freedom to be assigned are not known and a standard deviation of the usual form cannot be calculated.

portion of the total sum of squares of deviations occurred in only a few weeks of the year.

For 1955, the standard deviation of the errors of the estimate for weekly estimates of Interior hog marketings was 25,400 head. Marketings of hogs average 333,500 head per week for the year, and the average absolute deviation of the estimate from the actual supplies was 20,300 head. A small number of weeks in which the estimating error was very large accounted for a large part of the total error. For example, six weeks in which the estimating error was greater than 35,000 head accounted for 18,761,000, or 56 per cent, of the 33,514,000 total sum of squares of deviations. Well over half of the estimating errors were less than 20,100 head, Table 3. The 1955 estimating results are shown graphically in Figure 4.

Table 3. Frequency distribution of errors made in estimating weekly Interior hog supplies for the year 1955

size of error					
0 to 10,000	10,100 to 20,000	20,100 to 30,000	30,100 to 40,000	40,100 to 50,000	over 50,000
12	18	14	3	2	3

The weekly estimates for 1956 were slightly less precise than those made for 1955. Thus for 1956, the standard deviation of the errors of the estimate for weekly estimates was 30,000 head. Marketings for the year averaged 338,800 head

per week, and the average absolute deviation of the estimates from the actual supplies was 24,900 head. Again a large part of the total estimating error was contributed by a relatively small number of weeks. Twelve weeks in which the error was greater than 35,000 head accounted for 31,256,000, or 67 per cent, of the 46,732,000 total sum of squares of deviations, from which the standard deviation of the errors of the estimates was computed. Slightly less than half of the estimating errors were less than 20,100 head, Table 4.

Table 4. Frequency distribution of errors made in estimating weekly Interior hog supplies for the year 1956

size of error					
0 to 10,000	10,100 to 20,000	20,100 to 30,000	30,100 to 40,000	40,100 to 50,000	over 50,000
10	14	14	4	6	4

The comparison of actual and estimated weekly Interior hog supplies for 1956 is shown in Figure 5.

The actual marketing pattern for the first six months of 1957 showed several marked deviations from that expected from the seasonal index of hog marketings. As a result the estimating error was somewhat larger than for the previous two years, with several weeks during the period showing extreme deviations. The standard deviation of the errors of the estimate for weekly estimates of Interior hog marketings for the first six months of 1957 was 32,600 head. Marketings

during the period averaged 290,300 head, and the average absolute weekly deviation of the estimate from the actual sales was 25,000 head. Six weeks in which the error was greater than 35,000 head accounted for 21,685,000, or 78 per cent, of the 27,571,000 total sum of squares of deviations. Despite the occasional extreme errors, over half of the errors were less than 20,100 head, Table 5.

Table 5. Frequency distribution of errors made in estimating weekly Interior hog supplies for the first six months of 1957

size of error					
0 to 10,000	10,100 to 20,000	20,100 to 30,000	30,100 to 40,000	40,000 to 50,000	over 50,000
6	9	4	1	3	5

Actual and estimated weekly Interior hog marketings for the first six months of 1957 are shown graphically in Figure 6.

At the present time no estimates of expected weekly hog marketings in the Interior are available to hog producers. Thus there is no basis available for comparing the relative precision of these estimates. For the most part the estimating errors were relatively small in relation to the total volume of hogs marketed in a week. Since current factors were not considered in making these estimates, it is believed that some of the extreme errors of estimating could be avoided by adjusting on the basis of current conditions. This is dis-

cussed more fully in Chapter VIII. Furthermore, it would appear that advance weekly estimates of this type would be precise enough to be a useful aid to farmers and buyers in planning their buying and selling operations. It would give them information on expected supplies which is not now available, and should enable the Interior market to operate under conditions more nearly meeting those of a perfect market.

B. Daily Estimates of Interior Hog Marketings

Estimates were also made of daily hog marketings in the Interior for the years 1955, 1956, and the first half of 1957. These were based on the weekly marketing estimates made previously, and were derived by the method described in Chapter VI. Since the Market News Service of the U. S. Department of Agriculture is presently making mid-morning estimates of the current day's hog supply in the Interior, it was possible to compare the results obtained with the estimates now available to hog producers and the trade.

Timeliness of estimates

In comparing the two sets of estimates, consideration was given to the precision of the estimates and to their timeliness as well. In forecasting some future occurrence, precision normally can be expected to improve as the time period is shortened between the forecast and the actual event

as uncertain factors become more clearly established. This is not necessarily true for the estimating method used in this study, however, since it does not consider current conditions for the most part, but relies primarily on past marketing patterns.

The daily estimate of the current day's Interior hog supply that is now being made by the U.S. Department of Agriculture is not available until around mid-morning. Thus it is not fully effective in helping farmers with their marketing decisions. Advance estimates made by the method suggested in this study can be available to producers from a day to as much as six days in advance of the trading session to which they apply. Thus from the standpoint of timeliness alone, the proposed advance estimates would obviously be superior to those now available, since the producer would be able to make his marketing decision earlier and under more certain conditions. However, to be of greater total value it would appear that these estimates must also be at least nearly as precise as the ones now being made.

Precision of estimates

The results obtained in estimating daily Interior hog marketings were characterized by numerous large estimating errors, even though the majority of the estimates were reasonably accurate. Because of the wide fluctuations in

daily marketings, the estimating results did not adapt themselves to a graphical presentation as was done with the weekly marketing estimates. However, the actual daily marketings for the three periods tested, the U. S. Department of Agriculture estimates of marketings, and the estimates of marketings made in this study are all listed in tabular form in Appendix E.

The deviations from the actual marketings for both sets of estimates were obtained for each of the periods tested. The standard deviation of the errors of the estimate was computed for each series of estimates by the same formula used earlier. Thus the standard deviation of the errors of the estimate, s, is equal to the square root of the sum of the deviations squared, divided by the appropriate degrees of freedom. The average number of daily marketings and the average absolute deviation of the estimates are also presented to give additional information on the precision of the estimates.

In comparing the estimates, aggregate results for each annual period were used, except that for 1957 only the first six months were available for comparison. The overall results are summarized in Table 6.

For the year 1955, the standard deviation of the errors of the daily estimates was 7,800 head, compared with 6,800 head for the estimates made by the U. S. Department of Agri-

Table 6. Daily Interior hog supplies: Standard deviations of the errors of the estimates, and average absolute deviations of the estimates

Year[a]	Average daily supplies	Standard deviations of errors of the estimates		Average absolute deviations of the estimates	
		Advance[b] estimates	USDA[c] estimates	Advance[b] estimates	USDA[c] estimates
1955	56,500	7,800	6,800	5,900	5,000
1956	58,000	8,100	7,500	6,300	5,600
1957	48,700	11,600	8,700	9,000	6,700

[a]Includes only the first six months of 1957.

[b]Refers to advance estimates of hog supplies made in this study.

[c]Estimates made by the Federal-State Market News Service, Des Moines, Iowa.

culture. The daily supplies for the year averaged 56,500 head. The average absolute daily estimating error was 5,900 head, compared with an average error of 5,000 head for U. S. Department of Agriculture estimates. The frequency of the occurrence of estimating errors of different sizes for 1955 is shown in Table 7.

The daily estimates for the year 1956 resulted in a standard deviation of the errors of the estimates of 8,100 head, compared with 7,500 for the U. S. Department of Agriculture estimates. Marketings during the year averaged 58,000 head per marketing day. The average absolute devia-

Table 7. Frequency distribution of errors made in estimating daily Interior hog supplies for 1955

Size of error	Source of estimate	
	Advance estimates[a]	USDA estimates[b]
0 to 5,000	178	207
5,100 to 10,000	74	61
10,100 to 15,000	36	28
15,100 to 20,000	14	8
20,100 to 25,000	3	3
over 25,000	2	0

[a]Estimates made in this study.

[b]Estimates made by the Federal-State Market News Service, Des Moines, Iowa.

tion of the estimate was 6,300 head, while the average absolute deviation for U. S. Department of Agriculture estimates was 5,600 head. A frequency distribution of the daily estimating errors for 1956 is shown in Table 8.

The advance estimates of daily Interior hog marketings for the first six months of 1957 were less precise than those made for 1955 and 1956. Thus the standard deviation of the errors of the estimates of daily marketings was 11,600 head, compared with 8,700 head for U. S. Department of Agriculture estimates. Marketings for the first six months of 1957 averaged 48,700 head per marketing day. The average absolute deviation of the daily estimates was 9,000 head, and for the

Table 8. Frequency distribution of errors made in estimating daily Interior hog supplies for 1956

Size of error	Source of estimate	
	Advance estimates[a]	USDA estimates[b]
0 to 5,000	167	189
5,100 to 10,000	81	74
10,100 to 15,000	35	30
15,100 to 20,000	14	8
20,100 to 25,000	6	1
over 25,000	1	2

[a]Estimates made in this study.

[b]Estimates made by the Federal-State Market News Service, Des Moines, Iowa.

U. S. Department of Agriculture estimates the average absolute deviation was 6,700 head. A frequency distribution of the daily estimating errors for the first six months of 1957 is shown in Table 9.

In all three periods there were several instances of extreme estimating error. These contributed greatly to the total sum of squares of deviations from which the standard deviations of the errors of the estimates were computed. Some of these large estimating errors resulted from large errors in estimating weekly Interior hog supplies for the period, while others were due to weather and other irregular factors which affected marketings. A further discussion of

Table 9. Frequency distribution of errors made in estimating daily Interior hog supplies for the first six months of 1957

Size of error	Source of estimate	
	Advance estimates[a]	USDA estimates[b]
0 to 5,000	58	85
5,100 to 10,000	45	37
10,100 to 15,000	25	18
15,100 to 20,000	12	9
20,100 to 25,000	9	4
over 25,000	4	0

[a]Estimates made in this study.

[b]Estimates made by the Federal-State Market News Service, Des Moines, Iowa.

these results and suggested applications for the estimating method used will be presented in Chapter VIII which follows.

VIII. DISCUSSION

A. Interpretation and Suggested Application of Results

The weekly advance estimates of Interior hog supplies as developed in this study were based primarily on a weekly seasonal index of marketings, constructed from past marketings. The advance estimates of daily supplies were based on average daily proportions of weekly supplies as observed for a given period. Thus the current factors in the market were largely ignored. As a result, the estimating error was very large in several weeks in which marketings were affected by some unexpected occurrence. In some cases, however, no apparent cause for deviations from the expected marketing pattern was detected. Several factors were observed which caused the unexpected changes in hog supplies, although no attempt was made to quantify their effects.

Weather conditions affected marketings on several occasions, with cold weather and icy roads restricting the movement of hogs at times. For example, on January 9th, 1957, a snowstorm caused marketings to be unusually light that day, with the result that supplies were overestimated by 23,000 head. At other times rainy or otherwise unfavorable weather actually stimulated marketings by preventing farmers from working in their fields. This happened during the week beginning April 8th, 1957. On several occasions, the reaction

of producers to a higher or lower price trend seemed to cause large estimating errors. For example, on the 25th and 26th of January, 1957, resistance on the part of producers to a lower price trend resulted in very light marketings of hogs, and receipts were greatly overestimated. In contrast, marketings were sometimes held back when prices were moving up, apparently in anticipation of further advances. Unsettled labor conditions, which caused packing plants to limit purchases or to be temporarily out of the market for hogs, resulted in large estimating errors in a number of instances. Thus, during the week beginning July 30th, 1956, one of the interior packing plants did not buy hogs, and supplies were consistently overestimated during the week. The examples given here illustrate how marketings both for a specific day and for the week may be affected by unexpected happenings. They also point up the problem confronting anyone estimating short-run marketings or of trying to evaluate the effects of the many factors affecting daily sales.

Despite occasional large errors, the results obtained in estimating weekly Interior hog supplies in advance are, in general, thought to be reasonably good. The standard deviations of the errors obtained do not seem to be overly large in relation to the total volume of marketings that took place in most weeks. Since advance estimates of weekly mar-

ketings are not being made at the present time, no basis was available for comparing the precision of the estimates.

It is believed that the method used in this study does offer possibilities for use by the livestock industry and related agencies in forecasting short-run supplies. Several practical applications are suggested. First, it could be used by the U. S. Department of Agriculture as a complete procedure to provide hog producers and the livestock industry with advance estimates of the next week's marketings. This would not only give the producer added information on which to base his marketing decision, but it would also enable those agencies concerned with the transportation, processing, and distribution of livestock and livestock products to more efficiently plan their operations. Packing companies might find it of value in arriving at their own estimates of the volume of hogs or other livestock to expect the following week.

In addition, an experienced market observer could quite likely improve the estimating precision by making judgment adjustments on the basis of irregular factors that arise. Therefore, this method could be used in arriving at a base estimate of upcoming supplies, with adjustments being made in view of current factors that are likely to affect the marketing pattern. Since advance estimates of marketings are proposed in this study, the extent to which such revisions

could be made would depend on how soon any irregular conditions were observed. Even when the presence of such factors was not known in time for consideration in making the next day's or week's forecast, the effect of abnormally large or small supplies on succeeding marketings could be considered.

The daily estimates of Interior hog supplies made in this study were characterized by numerous large estimating errors, although for the most part the observed errors were quite moderate. Many of these can be traced to errors in the weekly estimates of supplies from which the daily estimates were derived. Others were due to irregular factors such as those already mentioned which affected the day's marketings.

Despite occasional very large estimating errors, on an average the results obtained were nearly as accurate as the later estimates made by the U. S. Department of Agriculture. In the practical application of this method of estimating supplies, it is suggested that some adjustments should be made in the estimates on the basis of current conditions, such as weather and other irregular factors. Many of the large errors could be eliminated if this were done by someone familiar with the particular market concerned.

When the element of timeliness is considered, the estimating method suggested in this study has potentially much greater value to hog producers than the one now being used.

If reasonably precise estimates of daily supplies can be made available to hog producers and members of the trade, marketing efficiency can be improved. To the extent that advance estimates of supplies are originally correct, marketings can be made under conditions more nearly approaching those of a perfect market.

The recommendations for the use of this method of estimating daily Interior hog marketings are much the same as those made for the weekly estimates. It is believed that the Market News Service of the U. S. Department of Agriculture, the packing industry, and other agencies of the hog and livestock industry could utilize this type of procedure in arriving at short-run estimates of marketings. Its application might extend not only to individual markets and market areas, but to aggregate marketings as well.

B. Limitations of this Study

The scope of this study made it impossible to delve into some of the basic problems in the marketing of hogs and other livestock. The real concern of farmers and the livestock industry in the marketing of livestock and livestock products is the existence of seasonal variations in supplies, and of weekly and daily fluctuations in supplies at market points. No attempt is made in this study to isolate, account for, or eliminate any of the causes for fluctuations in supplies.

Rather the existence of these fluctuations is merely recognized, and then used as a basis for estimating future changes in supplies.

C. Suggestions for Further Study

During the course of this study, several areas emerged on which knowledge is somewhat limited and where additional research is needed. One of these areas is the actual marketing decision process. How are marketing decisions made? What factors are considered, and what kinds of information are used by hog producers in deciding when and where to sell?

Another problem is that of actually isolating and eliminating the causes of wide fluctuations in daily and weekly supplies. Research in this area would also provide a basis for developing more analytical methods of estimating short-run supplies. Greater stability of short-run supplies should improve the efficiency of the marketing and distribution process at all levels.

Research is also needed to determine the effect of changes in short-run supplies on the prices received for hogs. If advance estimates of supplies are to be of maximum value, hog producers need some fairly specific knowledge of these effects in order to translate supply information into definite price expectations for their product. Demand factors must also be considered in forming any price expectation. This

means that research is needed to determine what the more important of these short-run demand factors are, and what price relationships exist.

IX. SUMMARY AND CONCLUSIONS

Deciding on a particular time and place to sell their hogs is a major problem for many Iowa hog producers. Poor marketing decisions mean a loss of income and lower net returns from the hog enterprise. Hog producers are often handicapped by a lack of information when deciding when and where to sell. This is often in the form of uncertainty about probable market supplies of hogs in the week or days just ahead.

Hog supplies in total and at specific markets follow a fairly regular seasonal pattern within the period of a year. Within this seasonal pattern of marketings are also found weekly and daily fluctuations in market supplies, caused by many factors. These variations in marketings are important to hog producers because prices in general respond to them by rising when marketings decrease, and falling when marketings increase. Variations in demand also cause prices to change.

At the present time, no advance estimates of expected weekly hog supplies on the Interior Iowa and Southern Minnesota market are available to hog producers. However, estimates are made of the current days expected direct marketings for the Interior. These are released by the Federal-State Market News Office in Des Moines. A deficiency of these estimates is that they are not advance estimates, and are

therefore not available in time to be fully effective as an aid in marketing.

Briefly this study attempts to develop a method by which both weekly and daily hog supplies can be estimated in advance. It is specifically concerned with estimating direct marketings of hogs at packing plants and local points in the Iowa and southern Minnesota market area.

The method suggested here is based on the assumptions that the seasonal pattern of marketings is fairly uniform from year to year, and that within a week, the proportion of the week's supply normally sold on each day is also fairly uniform from year to year. A weekly index of hog marketings for the Iowa and Southern Minnesota market was constructed based on actual marketings in a recent nine year period. This index became the basic part of the estimating procedure used for making advance estimates of weekly Interior hog supplies.

In estimating weekly supplies in advance the starting point was the past week's actual receipts. This figure was adjusted in the same proportion as the seasonal index changed from that week to the next. A simple regression analysis was made using preliminary estimates of weekly marketings for a two year period, and finding the relationship between these and the actual marketings. From this a single variable esti-

mating equation was developed from which final estimates of weekly supplies were made.

The weekly advance estimates of hog supplies were then used as a base for estimating daily supplies. The average proportions of the week's total hog supply that was sold on each day, based on a recent four year period, were used to break the weekly estimates into advance daily estimates of hog supplies.

The results obtained in estimating weekly marketings are thought to be precise enough to be of definite value to producers and other segments of the trade. It is felt that the U. S. Department of Agriculture and commercial agencies of the hog industry could successfully use the method described herein to provide producers and buyers as well with an advance estimate of weekly supplies.

Daily hog marketings fluctuate considerably from day to day. Although some uniformity was observed in the proportions of the week's supply sold on each day of the week, there were frequent deviations from this pattern. As a result the estimating precision for daily estimates was not as good as desired. However, the estimating error on an average was only moderately larger than that found for estimates made by the Market News Service of the U. S. Department of Agriculture. The U. S. Department of Agriculture estimates have the disadvantage of not being available until near noon of

the marketing day, whereas the proposed estimating procedure would permit estimates to be made from one to six days in advance.

Since there is a definite need for advance estimates of daily Interior hog supplies, it is thought that the method suggested here could be used to advantage by the U. S. Department of Agriculture and members of the trade. For the proposed method to be most effective in its use, it is recommended that some revisions be made currently in the estimates to allow for irregular factors such as the weather, which affect marketings.

Advance information on expected weekly and daily hog supplies would remove much of the uncertainty facing the hog producer in his marketing decisions. Some of the excesses and shortages in supplies that now occur would be eliminated and more stable prices should result. Reasonably precise estimates of this type would permit the Interior market to function under conditions nearer those of a perfect market, in which all buyers and sellers are perfectly informed of market conditions.

X. LITERATURE CITED

1. U. S. Code of Federal Regulations, 1953 (revised), Supplement, Title 7, Chap. 1, Pt. 53, Section 53, 151-153, 1956.

2. North Central Livestock Marketing Research Committee. Price differentials for slaughter hogs. Iowa Agr. Exp. Sta. Bul. P63, 1948.

3. Thompson, Sam H. What does effective hog marketing involve? Iowa Farm Science. 10, no. 3: 7-10. Sept. 1955.

4. _____. Economic trends in livestock marketing. (Planographed). St. Louis, Mo. John S. Swift Co. Inc. c1940.

5. U. S. D. A. Agricultural Marketing Service, Crop Reporting Board. Pig crop report, December 1956. (Mimeo.). 1956.

6. U. S. Agricultural Marketing Service. Cash receipts from major farm commodities by states. U. S. Dept. Agr. Stat. Bul. 186. 1956.

7. Iowa State College. (Preliminary) Report to farmers cooperating in the livestock marketing survey Iowa and northern Illinois. (Mimeo.). (Iowa Agr. Exp. Sta. Project 1229.) 1953.

8. Iowa Crop and Livestock Reporting Service. Iowa hog production and marketing. (Mimeo.). Des Moines, Iowa. The Service. 1952.

9. Bjorka, Knute. Estimating livestock receipts at public markets. (Mimeo.). B.A.E., U. S. Dept. Agr. 1940.

10. U. S. Production and Marketing Administration. The agricultural estimating and reporting services of the U. S. Department of Agriculture. U. S. Dept. Agr. Misc. Publication No. 703. 1949.

11. Dodds, Parry J. and Marvin, K. R. What does the Iowa farmer want from radio market news? Iowa Agr. Exp. Sta. Research Bul. 413. 1954.

12. Heiman, E. L., Federal-State Market News Service, Des Moines, Iowa. Information on Interior hog marketing estimates. Private communication. 1955.

13. Hartnell, James. Livestock Division, A.M.S., U. S. D. A. Washington, D. C. Information on daily livestock estimates. Private communication. 1955.

14. Cochran, William G. Sampling techniques. New York, John Wiley and Sons, Inc., 1953.

15. Francis, Oliver J. C. Statistical forecasting of livestock sales in Iowa and northern Illinois. Unpublished M.S. Thesis. Ames, Iowa, Iowa State College Library. 1954.

16. Elliott, F. F. Adjusting hog production to market trend. Illinois (Urbana) Agr. Exp. Sta. Bul. 293. 1927.

17. Schrader, F. M. Factors affecting hog production. Economic Division, Canada Dept. of Agriculture Marketing Service. Ottawa. 1953.

18. Darcovich, William and Heady, Earl O. Application of expectation models to livestock and crop prices and products. Iowa Agr. Exp. Sta. Research Bul. 438. 1956.

19. Baker, John D. Jr. An evaluation of the accuracy of federal economic forecasts. Unpublished Ph.D. Thesis. Lafayette, Indiana, Purdue University Library. 1952.

20. Heer, John F. Directional accuracy of farm price predictions published in the Iowa Farm Outlook Letter (July 1, 1948 to July 1, 1951). Unpublished M.S. Thesis. Ames, Iowa, Iowa State College Library. 1953.

21. Boulding, Kenneth E. Economic analysis. 3rd ed. New York, Harper and Brothers. 1955.

22. Marshall, Alfred. Principles of economics. 8th ed. London, England, Macmillan and Co., Limited. 1920.

23. Shepherd, Geoffrey S. Marketing farm products, economic analysis. 3rd ed. Ames, Iowa, Iowa State College Press. 1955.

24. U. S. D. A. Agricultural Marketing Service. Livestock Division, Market News. (Mimeo.). vols. 16 through 24 for period covering 1948-1956.

25. Foote, R. J. and Fox, Karl A. Seasonal variation: methods of measurement and tests of significance. U. S. Dept. Agr., Agriculture Handbook No. 48. 1952.

26. Snedecor, George W. Statistical methods. 5th ed. Ames, Iowa, Iowa State College Press. 1946.

27. Ostle, Bernard. Statistics in research; basic concepts and techniques for research workers. Ames, Iowa, Iowa State College Press. 1954.

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Of course, the author bears full responsibility for any errors or deficiencies in this study.

XII. APPENDICES

APPENDIX A: LOCATION OF PACKING PLANTS AND CONCENTRATION YARDS INCLUDED IN THE IOWA AND SOUTHERN MINNESOTA MARKET REPORTS[1]

1. Location of packing plants:

Mason City, Iowa
Dubuque, Iowa
Fort Dodge, Iowa
Des Moines, Iowa
Storm Lake, Iowa
Davenport, Iowa
Ottumwa, Iowa
Estherville, Iowa
Marshalltown, Iowa
Cedar Rapids, Iowa
Waterloo, Iowa
Austin, Minnesota
Albert Lea, Minnesota

2. Location of concentration yards:

Sheldon, Iowa
Algona, Iowa
Alta, Iowa
Cherokee, Iowa
Holstein, Iowa
Breda, Iowa
Dennison, Iowa
Carroll, Iowa
Dawson, Iowa
Perry, Iowa
Missouri Valley, Iowa
Atlantic, Iowa
Villisca, Iowa
Shenandoah, Iowa
Des Moines, Iowa
Burlington, Iowa
Marshalltown, Iowa
Belle Plaine, Iowa
Manchester, Iowa
West Liberty, Iowa
Washington, Iowa
Tracy, Iowa
Corning, Iowa
Postville, Iowa
Waverly, Iowa
Dubuque, Iowa
Tama, Iowa
Dewitt, Iowa
Oskaloosa, Iowa
Muscatine, Iowa

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[1] These are the market points for which estimates made in this study apply.

APPENDIX B: WEEKLY INDEXES OF INTERIOR HOG MARKETINGS

Table 10. Standard deviations of ratios to the moving average, and standard errors of the individual weekly index numbers

Week	Seasonal[a] index	Standard deviation of ratios to moving average	Standard error of index
1	136	4.91	1.64
2	148	3.62	1.21
3	141	4.81	1.60
4	123	4.75	1.58
5	110	4.57	1.53
6	115	6.97	2.32
7	106	4.54	1.51
8	98	2.83	.94
9	104	4.41	1.47
10	104	4.96	1.65
11	99	3.58	1.19
12	87	3.17	1.06
13	92	5.14	1.71
14	83	4.00	1.33
15	86	3.14	1.05
16	87	2.90	.97
17	86	4.00	1.37
18	82	2.55	.85
19	77	3.22	1.07
20	77	3.02	1.01
21	78	2.14	.71
22	75	3.18	1.06
23	82	5.19	1.73
24	81	5.62	1.87
25	77	3.79	1.26
26	71	3.07	1.02
27	64	2.87	.96
28	77	2.89	.96
29	73	2.59	.86
30	68	2.44	.81

[a]This is the original weekly index based on the means of the weekly ratios for the years 1948 through 1956.

Table 10. (Continued)

Week	Seasonal[a] index	Standard deviation of ratios to moving average	Standard error of index
31	69	1.20	.40
32	68	2.35	.78
33	70	3.55	1.18
34	72	3.38	1.13
35	73	3.98	1.33
36	72	5.18	1.73
37	83	5.87	1.96
38	93	5.27	1.76
39	97	5.57	1.86
40	101	5.07	1.69
41	106	5.08	1.69
42	114	3.84	1.28
43	114	4.38	1.46
44	127	4.77	1.59
45	133	6.59	2.20
46	143	3.88	1.29
47	154	7.53	2.51
48	149	4.47	1.49
49	163	6.52	2.17
50	156	3.87	1.29
51	143	4.74	1.58
52	113	4.04	1.35
	5200		

Table 11. Means of weekly ratios of Interior hog marketings to the moving average for the periods from 1948-51 and 1952-56

Week	1948-51	1952-56	Week	1948-51	1952-56
1	144	129	27	67	61
2	152	144	28	82	73
3	154	131	29	77	80
4	123	122	30	71	65
5	113	107	31	69	68
6	116	115	32	66	69
7	107	104	33	61	77
8	97	99	34	63	78
9	98	108	35	62	81
10	102	105	36	59	82
11	91	105	37	73	90
12	79	94	38	82	102
13	84	94	39	87	105
14	75	89	40	93	107
15	84	88	41	96	114
16	85	88	42	113	114
17	87	85	43	109	118
18	83	81	44	120	131
19	76	78	45	127	136
20	82	73	46	145	148
21	80	75	47	164	146
22	84	68	48	158	141
23	92	74	49	176	152
24	90	73	50	161	151
25	86	69	51	150	137
26	75	70	52	115	112

Table 12. Indexes of weekly Interior hog marketings

Week	Original[a] index	Estimated index for 1955	Estimated index for 1956	Estimated[b] index for 1957
1	136	128	126	123
2	148	142	140	138
3	141	127	122	117
4	123	118	116	114
5	110	102	99	96
6	115	107	104	102
7	106	100	98	96
8	98	101	101	102
9	104	110	112	114
10	104	106	106	107
11	99	104	105	107
12	87	95	98	101
13	92	99	101	103
14	83	92	95	98
15	86	90	91	92
16	87	89	89	90
17	86	89	90	91
18	82	83	83	84
19	77	81	83	84
20	77	72	70	69
21	78	76	75	74
22	75	66	62	59
23	82	70	67	63
24	81	69	65	61
25	77	65	61	57
26	71	68	67	66
27	64	58	56	54
28	77	69	67	65
29	73	67	65	63
30	68	63	61	60
31	69	67	67	66
32	68	70	71	72

[a]The original index is based on weekly Interior hog marketings for the years 1948 through 1956.

[b]If further changes in the seasonal pattern of hog marketings occur they will not necessarily be in the same direction or at the same rate as past changes. This means that the regressions used in adjusting the index for future years will require periodic revision. The basic index itself should also be revised as new data become available.

Table 12. (Continued)

Week	Original[a] index	Estimated index for 1955	Estimated index for 1956	Estimated[b] index for 1957
33	70	79	83	86
34	72	80	83	85
35	73	84	88	92
36	72	87	92	97
37	83	96	101	105
38	93	107	111	116
39	97	112	116	121
40	101	112	116	120
41	106	121	126	131
42	114	119	121	122
43	114	122	125	127
44	127	135	138	141
45	133	136	138	139
46	143	144	143	143
47	154	140	135	130
48	149	143	142	140
49	163	146	140	134
50	156	149	147	144
51	143	131	127	124
52	113	114	115	115
	5200	5200	5200	5200

APPENDIX C: DAILY PROPORTIONS OF WEEKLY INTERIOR HOG MARKETINGS

Table 13. Mean daily proportions of weekly Interior hog marketings for the years 1953 through 1956

Week[a]	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	19.0	18.0	19.0	19.0	15.0	10.0
2	21.0	16.0	18.0	16.0	18.0	11.0
3	18.5	21.0	17.5	15.0	18.0	10.0
4	20.0	17.0	16.0	17.0	19.0	11.0
5	19.0	19.5	18.5	18.5	13.5	11.0
6	22.0	16.0	16.0	16.0	18.0	12.0
7	20.0	17.5	19.0	16.5	17.0	10.0
8	holiday week					
9	19.0	18.5	17.5	16.5	17.0	12.0
10	20.0	19.0	17.5	20.5	13.5	9.5
11	21.0	19.5	17.5	17.0	15.5	9.5
12	21.0	19.0	17.0	17.5	16.0	9.5
13	19.0	18.0	19.5	18.0	15.0	10.5
14	18.5	21.0	19.0	17.0	13.5	11.0
15	17.0	15.0	19.0	20.5	17.5	11.0
16	18.0	15.5	20.0	18.0	16.5	12.0
17	21.5	16.0	17.5	16.5	18.0	11.5
18	22.0	18.5	19.5	13.0	15.5	11.5
19	20.0	18.0	16.0	18.0	17.0	11.0
20	19.0	17.0	17.0	17.0	16.5	13.5
21	20.5	19.0	18.0	19.0	14.5	9.0
22	holiday week					
23	21.0	19.0	19.0	16.0	14.0	11.0
24	21.0	18.5	17.5	17.0	14.0	12.0
25	20.0	19.0	18.0	15.0	15.0	13.0
26	17.0	20.0	19.0	18.0	16.0	10.0
27	holiday week					
28	19.5	16.0	17.0	17.5	15.0	15.0
29	17.0	19.0	19.0	16.0	17.0	13.0
30	16.5	18.0	20.0	18.0	15.0	12.5

[a] Proportions for weeks in which holidays occur are omitted since a slightly different procedure was used for those weeks.

Table 13. (Continued)

Week[a]	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31	22.0	19.0	17.0	16.0	15.0	11.0
32	20.0	18.0	19.0	17.0	15.0	11.0
33	18.0	18.0	17.0	18.0	17.0	12.0
34	21.0	18.0	17.0	17.0	16.0	11.0
35	22.0	17.0	16.5	15.0	18.0	11.5
36	holiday week					
37	22.0	16.0	16.0	17.0	17.0	12.0
38	19.0	18.0	17.0	17.0	18.0	11.0
39	21.0	19.0	15.5	17.5	16.0	11.0
40	19.0	18.0	18.0	17.0	17.0	11.0
41	21.0	17.0	18.0	18.0	15.0	11.0
42	21.0	17.0	17.5	18.0	15.5	11.0
43	20.0	19.0	17.5	16.0	17.5	10.0
44	22.0	17.0	17.0	17.0	17.0	10.0
45	holiday week					
46	20.0	18.0	18.0	17.0	16.0	11.0
47	holiday week					
48	19.0	19.0	18.0	15.0	17.0	12.0
49	22.0	18.0	17.0	16.0	15.0	12.0
50	21.0	18.0	17.0	17.0	17.0	10.0
51	23.0	18.5	17.0	18.5	15.0	8.0
52	holiday week					

APPENDIX D: WEEKLY INTERIOR HOG MARKETINGS

Table 14. Actual and estimated weekly Interior hog marketings for 1955 (thousand head)

Week	Actual marketings	Preliminary[a] estimate	Final[b] estimate	Deviation[c]
1	409	375	372	-37
2	399	454	446	47
3	393	357	395	2
4	381	365	363	-18
5	300	329	329	29
6	337	315	316	-21
7	301	315	316	15
8	330	304	305	-25
9	335	359	357	22
10	365	323	323	-42
11	336	358	318	-18
12	287	307	308	21
13	297	299	301	4
14	268	276	279	11
15	289	262	266	-23
16	257	286	289	32
17	280	257	291	11
18	252	261	265	13
19	278	246	251	-27
20	269	247	252	-17
21	266	284	287	21
22	207	231	237	30
23	195	220	256	61
24	212	192	200	-12
25	189	200	208	19

[a] Preliminary estimates were made by adjusting the previous week's marketings in the same proportion as the weekly index of marketings changed.

[b] Final estimates were made from the estimating equation, $Y = 20.17 + .9384X_1$, where Y is the final estimate of marketings and X_1 is the preliminary estimate.

[c] The deviations represent the difference between the actual marketings and the final estimates of marketings.

Table 14. (Continued)

Week	Actual marketings	Preliminary[a] estimate	Final[b] estimate	Deviation[c]
26	206	198	225	19
27	204	176	185	-19
28	233	243	248	15
29	220	266	232	12
30	210	207	214	4
31	228	223	229	1
32	251	238	244	- 7
33	278	283	286	8
34	266	282	285	19
35	295	279	282	-13
36	299	306	307	8
37	343	330	330	-13
38	357	382	379	22
39	380	374	371	- 9
40	393	380	377	-16
41	440	425	419	-21
42	448	433	427	-21
43	448	459	451	3
44	502	496	486	-16
45	453	506	454	1
46	494	480	471	-23
47	468	480	471	3
48	522	478	469	-53
49	553	533	470	-83
50	541	564	549	8
51	448	486	476	28
52	417	390	386	-31

Table 15. Actual and estimated weekly Interior hog marketings for 1956 (thousand head)

Week	Actual marketings	Preliminary[a] estimate	Final[b] estimate	Deviation[c]
1	457	461	453	- 4
2	512	508	497	-15
3	415	446	439	24
4	340	395	391	51
5	372	290	334	-38
6	405	391	350	-55
7	391	382	379	-12
8	387	403	398	11
9	456	429	423	-33
10	424	432	426	2
11	369	420	414	45
12	338	344	382	44
13	331	348	347	16
14	336	311	312	-24
15	305	322	322	17
16	330	298	300	-30
17	356	334	334	-22
18	342	328	328	-14
19	281	342	341	60
20	207	237	290	83
21	244	222	229	-15
22	214	202	210	- 4
23	253	231	237	-16
24	266	245	250	-16
25	225	250	255	30
26	252	247	283	31
27	208	211	218	10
28	232	249	254	22
29	257	225	231	-26
30	223	241	224	1

[a] Preliminary estimates were made by adjusting the previous week's marketings in the same proportion as the weekly index of marketings changed.

[b] Final estimates were made from the estimating equation, $Y = 20.17 + .9384X_1$, where Y is the final estimate of marketings and X_1 is the preliminary estimate.

[c] The deviations represent the difference between the actual marketings and the final estimates of marketings.

Table 15. (Continued)

Week	Actual marketings	Preliminary[a] estimate	Final[b] estimate	Deviation[c]
31	220	245	250	30
32	252	233	239	-13
33	250	295	297	47
34	258	250	299	41
35	280	274	277	- 3
36	308	293	295	-13
37	365	338	337	-28
38	366	401	396	30
39	361	382	379	18
40	363	361	359	- 4
41	351	394	390	39
42	419	337	372	-47
43	409	433	381	-28
44	429	452	444	15
45	433	429	423	-10
46	432	449	442	10
47	423	408	403	-20
48	461	445	438	-23
49	421	455	447	26
50	389	442	435	46
51	381	336	373	- 8
52	320	345	344	24

Table 16. Actual and estimated weekly Interior hog marketings for 1957[a] (thousand head)

Week	Actual marketings	Preliminary[b] estimate	Final[c] estimate	Deviations[d]
1	326	342	341	15
2	372	366	364	- 8
3	340	315	316	-24
4	242	331	331	89
5	335	204	282	-53
6	315	356	302	-13
7	346	296	298	-48
8	284	368	291	7
9	338	317	318	-20
10	386	316	317	-69
11	334	386	318	-16
12	328	315	316	-12
13	318	334	334	16
14	292	303	305	13
15	228	274	277	47
16	296	223	275	-21
17	295	299	301	6
18	256	272	275	19
19	289	256	261	-28
20	284	237	243	-41
21	237	305	251	14
22	217	189	214	- 3
23	265	232	238	-27
24	241	257	236	- 5
25	237	225	231	- 6
26	246	274	277	31

[a]Estimates were made for only the first six months of 1957.

[b]Preliminary estimates were made by adjusting the previous week's marketings in the same proportion as the weekly index of marketings changed.

[c]Final estimates were made from the estimating equation, $Y = 20.17 + .9384X_1$, where Y is the final estimate of marketings and X_1 is the preliminary estimate.

[d]The deviations represent the difference between the actual marketings and the final estimates of marketings.

APPENDIX E: DAILY INTERIOR HOG MARKETINGS

Table 17. Daily Interior hog marketings for 1955: Comparison of actual receipts with advance estimates made in this study, and with estimates made by the U. S. Department of Agriculture (thousand head)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
1-1-55				1-31-55	63	63	65
2				2- 1-55	43	64	55
3	87	71	95	2	53	61	50
4	80	67	80	3	64	61	50
5	69	71	70	4	45	44	50
6	87	71	75	5	32	36	33
7	47	55	60	6			
8	38	37	42	7	87	69	65
9				8	62	51	62
10	85	94	85	9	46	51	50
11	58	71	65	10	46	51	55
12	80	80	80	11	67	57	55
13	77	72	75	12	30	37	32
14	66	80	50	13			
15	33	49	32	14	66	63	65
16				15	48	55	50
17	71	73	75	16	68	60	68
18	83	82	75	17	52	52	45
19	76	69	75	18	41	54	40
20	46	59	55	19	27	32	28
21	78	71	70	20			
22	39	41	37	21	77	70	60
23				22	19	18	Holiday
24	84	72	85	23	57	52	55
25	76	62	75	24	62	58	65
26	41	58	55	25	73	67	67
27	63	62	65	26	42	40	30
28	74	69	75	27			
29	43	40	40	28	57	68	60
30				3-1-55	63	66	65

[a]These estimates were made by the method developed in this study.

[b]These estimates were made by the Federal-State Market News Service, Des Moines, Iowa.

Table 17. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
3-2-55	75	62	65	4-14-55	50	55	45
3	48	59	50	15	54	47	42
4	53	60	50	16	30	29	27
5	39	42	40	17			
6				18	43	52	50
7	74	65	65	19	45	45	50
8	64	61	65	20	59	58	50
9	62	57	60	21	44	52	45
10	74	66	72	22	36	47	40
11	56	44	57	23	31	35	27
12	36	30	35	24			
13				25	75	63	52
14	62	67	65	26	45	47	47
15	64	62	65	27	35	50	38
16	61	56	57	28	43	47	40
17	65	54	70	29	50	51	47
18	54	49	65	30	33	33	30
19	31	30	38	5-1-55			
20				2	44	58	45
21	54	65	55	3	41	49	40
22	61	59	60	4	72	52	50
23	56	52	60	5	35	34	37
24	55	54	60	6	31	41	35
25	36	49	50	7	30	31	25
26	25	29	32	8			
27				9	66	50	60
28	61	57	60	10	53	45	51
29	53	54	55	11	36	40	40
30	57	59	55	12	41	45	42
31	52	54	55	13	52	43	50
4-1-55	45	45	47	14	31	28	30
2	30	32	25	15			
3				16	48	48	50
4	43	52	55	17	52	43	50
5	58	59	50	18	48	43	42
6	52	53	52	19	43	43	40
7	50	47	53	20	44	42	45
8	37	38	42	21	34	33	32
9	28	30	25	22			
10				23	50	58	43
11	60	45	53	24	50	55	50
12	52	40	52	25	37	51	45
13	44	50	47	26	59	55	55

Table 17. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
5-27-55	49	42	52	7-10-55			
28	22	26	25	11	55	49	45
29				12	35	40	45
30	Holiday			13	41	42	38
31	44	50	52	14	40	43	37
6- 1-55	47	52	50	15	40	37	32
2	47	55	50	16	22	37	25
3	43	50	50	17			
4	26	30	30	18	37	39	45
5				19	31	44	35
6	44	54	45	20	34	44	35
7	43	49	48	21	38	37	35
8	28	49	40	22	42	39	37
9	30	41	35	23	38	31	25
10	28	36	27	24			
11	23	27	22	25	42	35	45
12				26	31	38	33
13	37	42	40	27	35	43	30
14	32	37	35	28	40	39	32
15	34	35	35	29	35	32	35
16	38	34	35	30	26	27	23
17	37	28	32	31			
18	35	24	25	8-1-55	50	50	47
19				2	40	44	40
20	38	42	37	3	37	39	37
21	42	40	35	4	32	37	35
22	34	37	33	5	37	34	35
23	28	31	30	6	32	25	27
24	25	31	30	7			
25	23	27	25	8	53	49	50
26				9	40	44	40
27	41	38	38	10	49	46	48
28	40	45	37	11	42	41	42
29	43	43	35	12	39	37	40
30	32	40	33	13	31	27	28
7- 1-55	32	36	37	14			
2	18	23	20	15	55	52	55
3				16	50	51	48
4	Holiday			17	46	49	45
5	55	48	45	18	50	51	50
6	49	44	43	19	45	49	45
7	34	32	35	20	33	34	30
8	36	33	35	21			
9	30	28	28	22	63	60	58

Table 17. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
8-23-55	42	51	50	10-6-55	60	64	60
24	38	48	45	7	65	64	67
25	46	48	45	8	43	41	50
26	45	46	45	9			
27	37	32	33	10	84	88	75
28				11	76	71	70
29	55	62	55	12	86	75	75
30	46	48	47	13	70	75	65
31	65	47	52	14	71	63	70
9- 1-55	44	42	45	15	54	47	45
2	53	51	50	16			
3	33	32	30	17	95	90	80
4				18	72	72	70
5	Holiday	6		19	79	75	67
6	69	74	60	20	77	77	65
7	62	64	50	21	76	66	75
8	60	58	52	22	49	47	50
9	40	52	58	23			
10	57	53	40	24	98	90	85
11				25	70	86	80
12	65	72	65	26	72	79	80
13	56	53	65	27	73	72	75
14	56	53	60	28	88	79	80
15	62	56	65	29	48	45	48
16	56	56	57	30			
17	49	40	45	31	103	107	95
18				11-1-55	75	82	80
19	74	72	65	2	90	83	85
20	46	68	48	3	80	82	75
21	54	64	50	4	87	83	80
22	68	64	65	5	67	49	60
23	71	69	65	6			
24	44	42	43	7	115	109	105
25				8	89	91	85
26	84	78	68	9	77	77	75
27	55	70	55	10	89	91	75
28	55	58	65	11	30	32	Holiday
29	78	65	75	12	53	54	50
30	63	59	60	13			
10-1-55	46	41	45	14	96	94	95
2				15	93	85	90
3	66	72	80	16	87	85	85
4	84	68	75	17	86	80	80
5	75	68	65	18	79	75	75

Table 17. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
11-19-55	53	52	55	12-11-55			
20				12	111	115	110
21	115	104	100	13	100	99	95
22	82	80	80	14	91	93	90
23	83	89	85	15	85	93	90
24	Holiday		Holiday	16	91	93	85
25	110	137	105	17	63	56	65
26	78	61	65	18			
27				19	95	109	90
28	102	89	115	20	83	88	85
29	104	89	85	21	78	81	80
30	79	84	85	22	86	88	75
12- 1-55	83	70	85	23	75	72	90
2	89	80	90	24	31	38	40
3	65	57	70	25			
4				26	Holiday		
5	123	103	105	27	110	104	100
6	95	85	85	28	94	89	70
7	80	80	85	29	90	85	85
8	85	75	95	30	80	77	80
9	97	71	90	31	32	31	40
10	74	56	70				

Table 18. Daily Interior hog marketings for 1956: Comparison of actual receipts with advance estimates made in this study, and with estimates made by the U. S. Department of Agriculture (thousand head)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
1-1-56				1-31-56	90	65	80
2	Holiday			2- 1-56	73	62	70
3	122	118	115	2	64	62	60
4	96	91	95	3	47	45	50
5	86	82	90	4	35	37	35
6	87	82	85	5			
7	54	49	58	6	88	77	70
8				7	64	56	75
9	102	104	105	8	59	56	72
10	95	80	90	9	62	56	70
11	86	89	85	10	73	63	65
12	81	80	80	11	52	42	40
13	94	89	90	12			
14	55	55	55	13	86	76	85
15				14	73	66	75
16	82	81	90	15	56	72	60
17	96	92	95	16	49	63	65
18	83	77	85	17	82	64	70
19	70	66	85	18	45	38	45
20	57	79	65	19			
21	27	44	40	20	75	76	75
22				21	65	68	65
23	55	78	65	22	23	20	Holiday
24	44	66	55	23	110	115	90
25	43	63	45	24	61	64	65
26	74	66	65	25	53	55	45
27	85	75	70	26			
28	39	43	35	27	89	80	90
29				28	90	78	80
30	63	63	75	29	70	74	80

[a]These estimates were made by the method developed in this study.

[b]These estimates were made by the Federal-State Market News Service, Des Moines, Iowa.

Table 18. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
3-1-56	73	69	80	4-14-56	34	36	30
2	80	72	80	15			
3	54	50	50	16	71	54	60
4				17	58	47	55
5	75	85	90	18	48	60	50
6	78	81	85	19	56	54	50
7	70	75	75	20	55	49	45
8	95	87	85	21	42	36	33
9	70	58	80	22			
10	37	40	45	23	67	71	65
11				24	52	53	50
12	78	87	70	25	80	58	65
13	76	81	80	26	57	55	55
14	67	72	75	27	63	60	55
15	60	70	70	28	37	37	45
16	58	64	65	29			
17	30	40	35	30	85	72	70
18				5-1-56	55	60	60
19	67	80	65	2	67	64	65
20	64	73	75	3	46	43	55
21	50	65	65	4	64	51	55
22	64	67	65	5	25	38	32
23	61	61	60	6			
24	32	36	30	7	47	68	60
25				8	51	61	60
26	70	66	65	9	50	55	55
27	52	62	65	10	60	61	55
28	61	68	60	11	52	58	55
29	70	62	60	12	21	38	28
30	43	52	50	13			
31	35	37	30	14	41	55	55
4-1-56				15	29	49	45
2	74	58	65	16	32	49	35
3	64	66	65	17	36	49	37
4	63	59	60	18	37	48	38
5	44	53	50	19	34	40	25
6	52	42	55	20			
7	39	34	30	21	50	47	45
8				22	50	44	50
9	47	55	60	23	52	41	45
10	41	48	50	24	40	44	42
11	69	61	55	25	30	33	35
12	62	66	55	26	23	20	27
13	53	56	50	27			

Table 18. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
5-28-56	58	59	50	7-11-56	40	43	35
29	27	28	38	12	54	44	47
30	Holiday			13	38	38	40
31	52	51	45	14	22	38	23
6- 1-56	46	42	45	15			
2	31	30	28	16	42	39	45
3				17	47	44	40
4	49	50	50	18	59	44	42
5	46	45	45	19	48	37	45
6	60	45	45	20	38	39	40
7	44	38	40	21	23	28	25
8	30	33	40	22			
9	25	26	23	23	34	37	45
10				24	44	40	45
11	58	53	45	25	41	45	40
12	49	46	45	26	43	40	40
13	46	44	42	27	35	34	40
14	44	43	45	28	27	28	24
15	42	35	37	29			
16	27	29	25	30	51	55	50
17				31	48	48	45
18	51	51	50	8-1-56	38	43	37
19	39	48	42	2	34	39	37
20	41	46	38	3	29	38	30
21	36	38	42	4	20	27	22
22	38	39	35	5			
23	21	33	25	6	53	48	45
24				7	43	43	45
25	36	48	45	8	49	45	42
26	63	57	50	9	39	41	40
27	42	54	45	10	41	36	38
28	40	51	40	11	27	26	27
29	40	45	38	12			
30	31	28	25	13	53	54	50
7- 1-56				14	43	54	42
2	55	59	50	15	35	50	42
3	36	37	40	16	44	53	40
4	Holiday			17	47	50	45
5	51	52	50	18	28	36	25
6	39	41	40	19			
7	28	28	30	20	53	63	45
8				21	52	54	47
9	42	50	45	22	44	51	45
10	36	41	40	23	45	51	40

Table 18. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
8-24-56	40	48	37	10-6-56	46	39	42
25	25	32	25	7			
26				8	72	82	70
27	52	61	45	9	55	66	65
28	51	47	47	10	64	70	65
29	50	46	45	11	64	70	65
30	48	42	45	12	56	59	60
31	50	50	40	13	41	43	40
9-1-56	30	31	22	14			
2				15	105	78	80
3	Holiday			16	60	63	70
4	77	71	60	17	60	65	60
5	66	62	50	18	68	67	65
6	59	56	55	19	75	58	70
7	62	50	55	20	52	41	50
8	46	50	40	21			
9				22	83	76	80
10	66	74	65	23	71	72	70
11	65	54	60	24	74	67	70
12	62	54	57	25	76	61	70
13	59	57	55	26	70	67	65
14	66	57	65	27	36	38	38
15	49	41	38	28			
16				29	92	98	80
17	69	75	70	30	81	76	80
18	66	71	65	31	71	75	75
19	67	67	65	11-1-56	74	75	70
20	65	67	65	2	70	75	75
21	55	71	65	3	42	45	47
22	45	45	40	4			
23				5	110	102	90
24	80	80	75	6	71	68	70
25	65	72	72	7	80	74	80
26	58	59	60	8	72	72	75
27	65	66	60	9	62	63	65
28	54	61	52	10	38	44	40
29	39	41	35	11			
30				12	27	27	Holiday
10-1-56	71	68	80	13	98	102	100
2	64	65	60	14	81	84	80
3	56	65	65	15	93	97	90
4	64	61	65	16	84	84	80
5	46	39	42	17	49	48	50

Table 18. (Continued)

Date	Actual receipts	Advance estimates[a]	USDA estimates[b]	Date	Actual receipts	Advance estimates[a]	USDA estimates[b]
11-18-56				12-10-56	71	91	70
19	82	89	90	11	79	78	75
20	81	68	90	12	68	74	80
21	83	77	70	13	59	74	65
22	Holiday			14	76	74	68
23	125	117	90	15	36	44	40
24	52	52	55	16			
25				17	74	86	75
26	86	83	90	18	68	69	70
27	87	83	85	19	71	63	67
28	87	79	90	20	75	69	70
29	76	66	85	21	64	56	67
30	74	74	75	22	30	30	35
12- 1-56	52	53	55	23			
2				24	33	34	Holiday
3	93	98	85	25	Holiday		
4	82	80	85	26	112	120	85
5	77	76	85	27	70	76	75
6	68	72	80	28	59	62	65
7	65	67	75	29	47	52	35
8	37	54	45	30			
9				31	69	72	70

Table 19. Daily Interior hog marketings for 1957[a]: Comparison of actual receipts with advance estimates made in this study, and with estimates made by the U. S. Department of Agriculture

Date	Actual receipts	Advance estimates[b]	USDA estimates[c]	Date	Actual receipts	Advance estimates[b]	USDA estimates[c]
1-1-57	Holiday			2-1-57	48	38	45
2	80	82	100	2	30	31	28
3	52	68	70	3			
4	83	75	70	4	79	67	60
5	42	44	42	5	61	49	60
6				6	53	48	50
7	60	76	73	7	49	48	50
8	73	58	70	8	45	54	40
9	43	66	60	9	28	36	27
10	78	58	65	10			
11	78	66	75	11	80	60	60
12	41	40	45	12	73	52	60
13				13	68	57	65
14	58	58	70	14	57	49	60
15	76	66	70	15	41	51	50
16	56	55	70	16	28	29	32
17	62	47	65	17			
18	54	57	75	18	58	58	60
19	35	33	35	19	51	64	55
20				20	63	58	55
21	52	66	60	21	60	50	55
22	59	57	55	22	21	23	Holiday
23	58	53	55	23	32	38	25
24	42	56	50	24			
25	16	63	40	25	73	60	60
26	16	36	20	26	59	59	60
27				27	81	56	65
28	61	54	50	28	55	52	60
29	70	55	50	3-1-57	41	54	45
30	69	52	55	2	29	38	27
31	58	52	50	3			

[a]Estimates were made for only the first six months of 1957.

[b]These estimates were made by the method developed in this study.

[c]These estimates were made by the Federal-State Market News Service, Des Moines, Iowa.

Table 19. (Continued)

Date	Actual receipts	Advance estimates[b]	USDA estimates[c]	Date	Actual receipts	Advance estimates[b]	USDA estimates[c]
3-4-57	85	63	65	4-16-57	52	43	45
5	68	60	65	17	64	55	50
6	51	55	60	18	54	50	50
7	72	65	65	19	39	45	40
8	75	43	70	20	30	33	20
9	37	31	35	21			
10				22	72	65	65
11	70	67	75	23	47	48	55
12	74	62	75	24	42	52	43
13	60	56	60	25	49	49	45
14	42	54	55	26	55	53	45
15	43	49	55	27	32	34	30
16	45	30	35	28			
17				29	43	60	50
18	42	66	50	30	34	51	42
19	73	60	50	5-1-57	44	53	40
20	70	54	65	2	60	38	50
21	57	55	60	3	48	43	45
22	51	51	55	4	28	30	30
23	36	30	35	5			
24				6	49	52	45
25	53	63	40	7	39	47	40
26	78	61	65	8	54	42	50
27	55	65	65	9	59	47	47
28	50	60	55	10	61	44	60
29	52	50	47	11	29	29	30
30	32	35	33	12			
31				13	59	46	60
4-1-57	63	56	60	14	39	41	45
2	59	64	60	15	64	42	50
3	46	58	50	16	50	41	47
4	47	52	45	17	41	40	50
5	49	41	45	18	32	33	28
6	29	34	33	19			
7				20	55	51	55
8	51	47	60	21	54	48	55
9	35	42	45	22	37	45	40
10	25	53	35	23	32	48	40
11	36	57	30	24	25	36	30
12	46	48	35	25	35	23	25
13	29	30	30	26			
14				27	52	47	45
15	58	50	50	28	35	43	37

Table 19. (Continued)

Date	Actual receipts	Advance estimates[b]	USDA estimates[c]	Date	Actual receipts	Advance estimates[b]	USDA estimates[c]
5-29-57	47	45	40	6-15-57	20	28	25
30	Holiday			16			
31	53	47	50	17	41	46	40
6-1-57	31	32	35	18	69	44	45
2				19	36	42	40
3	44	50	45	20	30	35	32
4	38	45	37	21	26	34	35
5	48	45	35	22	35	30	25
6	51	38	45	23			
7	62	34	45	24	54	47	40
8	23	26	25	25	56	55	50
9				26	43	53	45
10	46	50	50	27	38	50	35
11	46	44	42	28	38	44	40
12	45	41	40	29	18	28	25
13	38	40	42	30			
14	47	33	42				