A PROPOSAL TO STUDY THE BEHAVIOR OF HOG PRICES IN THE PHILIPPINES

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by

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INTRODUCTION

The Livestock Industry in the Philippines

Livestock and poultry are among the more significant sources of value added in agriculture in the Philippines. The value added is made up of contributions from carabaos, cattle, horses, swine, sheep, chickens, ducks, geese, and turkeys. For 1968-1973, the average net value added in agriculture of livestock and poultry are 28.5 and 17.6 per cent, respectively.[1] As of 1973, the Philippines had a total livestock population of 4,937,000 carabaos, 2,099,100 cattle, 8,627,000 hogs, 1,248,000 goats, and 49,964,000 chickens, and 2,906,000 ducks in the poultry group. In the same year, hogs had an inventory value on farms of ₱753,874,000.[2]

The backyard swine producers supply the major portion of the total pork output in the country. Some 80 to 90 per cent of the total hogs produced are raised and slaughtered in the backyard for home consumption and sale in the local markets although commercial piggeries have expanded quite rapidly in the last five years, particularly, in Central Luzon and South Cotabato.[3] During the period 1961 to 1972, hog population exhibited an increasing trend. The highest hog population was attained in 1972 with some 8.0 million head, which indicated an increase of 10 per cent over that of 1971. In 1972, the major

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[1]Agriculture Staff, National Economic and Development Authority, Philippine Agriculture in the Last Twenty Years (Manila, Philippines, 1975), p. 22.

[2]National Census and Statistics Office, National Economic and Development Authority, Statistical Handbook of the Philippines (Manila, Philippines, 1976), p. 60.

[3]Russell J. Cheetham and Edward K. Hawkins, The Philippines: Priorities and Prospects for Development, a World Bank Country Economic Report (Washington, D.C.: The World Bank, 1976), p. 142.

hog producing region was Eastern Visayas, contributing about 18.2 per cent to the entire hog population. Next to Eastern Visayas was the Southern Tagalog region with a contribution of 16.8 per cent.[4] Table 1 indicates hog population in the different regions for the period 1961-1972. In the case of carabao and beef-cattle production, more than 80 per cent of the total population is found in Luzon and Mindanao. Carabaos are used by small farmers for draft in rice paddies and are killed when they become too old to work or breed. On the other hand, cattle grazing under coconut trees on improved pastures has increasingly become one way of raising beef cattle that offers a great potential for increasing beef output among small farmers.

In the past, production of meat was below the demand requirements of the increasing population. To fill the gap between production and consumption, the country has resorted to importation of processed and live hogs for both meat and breeding purposes. By 1985, it is projected that pork consumption will be about 700,000 metric tons which means that nearly 20 million hogs will be needed for slaughter. It is then estimated that the national herd will have to be expanded annually by about 7 per cent in the next decade in order to support this desired level of production.[5] The increasing demand and the need to increase production is due to the fact that products such as meat and poultry are preferred by families with higher incomes so that the income elasticity of demand is relatively high.

On the marketing side, the industry has been confronted by problems like lack or total absence of grading or standardization of live animals, lack of standard weighing scales for large livestock, lack of centralized marketing

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[4]"Philippine Agriculture in the Last Twenty Years," 1975, p. 44.

[5]Cheetham and Hawkins, p. 142.

Table 1. Hog population by region, Philippines, 1961-1972 (in 000 head).

REGION	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Philippines	6,191	6,726	6,234	6,616	6,939	6,914	5,497	6,090	6,350	6,457	7,050	7,742
Percent increase (or decrease)	--	9	(7)	6	5	*	(21)	11	4	2	9	10
Ilocos	427	464	351	352	172	158	141	97	109	125	152	168
Cagayan Valley	549	596	717	797	785	599	480	551	623	609	639	783
Central Luzon	943	1,025	1,090	1,060	775	571	621	666	724	713	798	964
Southern Tagalog	699	760	563	646	786	791	626	738	776	925	1,124	1,298
Bicol	446	484	559	662	747	717	623	737	700	756	692	674
Eastern Visayas	1,292	1,403	1,113	1,138	1,188	1,445	892	966	1,074	1,083	1,315	1,407
Western Visayas	1,075	1,168	979	970	951	658	530	677	734	753	922	1,068
Northern & Eastern Mindanao	487	530	533	688	904	1,421	1,147	1,199	1,065	985	867	796
Southern & Western Mindanao	274	297	329	306	632	553	438	459	545	506	540	584

* : Less than 1 per cent.

Source of basic data: Bureau of Agricultural Economics.

centers for livestock in most provinces, and non-availability of market information to producers.[6] With the consequent marketing inefficiency, both operational and pricing inefficiencies, the producers are generally placed in a relatively inferior bargaining position while the consumers' demands are often not met.

Realizing the necessity to correct such defects in the industry and to limit dependence on imports, extensive efforts are being undertaken to improve both production and marketing of livestock. In general, government programs include improving extension services, animal health, artificial insemination services, and research activities. The Bureau of Animal Industry is intensifying its efforts to conserve, promote, and develop the industry. At present, the Bureau maintains 9 stock farms, 52 breeding stations, 12 breeding centers, and 44 artificial insemination units.[7] Other government institutions provide intensive research aimed at achieving a higher level of efficiency in both production and marketing. An increase in the supply of credit is also becoming an important factor in helping farmers expand livestock production.

A major breakthrough towards a more efficient marketing system is the introduction of a system of livestock auction markets. It is a relatively new system but it hopes to bring about some improvement in the industry. The system is advantageous to the farmers since it encourages bidding among buyers and it affords a more accurate determination of weight of the animals. The market is provided with facilities to effect a smooth flow of animals for receiving, selling, and loading out along with the other services for the convenience of both the buyers and the sellers. Prices are determined

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[6]"Philippine Agriculture in the Last Twenty Years," 1975, p. 127.

[7]"Statistical Handbook of the Philippines," 1976, p. 59.

competitively so that sellers are put in a better bargaining position. When auction sales are properly scheduled, both production and marketing can be more effectively planned. A system of auction markets would make available market information with both buyers and sellers being exposed to the trend of prices and other developments in the market. The establishment of the Food Terminal, Inc. which used to be known as the Greater Manila Terminal Food Market is another step to improve the marketing of agricultural commodities, including livestock and poultry. It is intended to become a combined producer-transit wholesaler market complex. The development of cooperatives also is being undertaken currently to provide better marketing opportunities through participation in assembly, storage, processing, and distribution.

If the programs are implemented fully, the livestock industry will face a bright future. There is an optimistic attitude among the people involved that the supply of meat in the country will increase and dependence on imported meat and meat preparations will be reduced. At the same time, expansion of livestock production will generate increasing incomes for farmers who depend on livestock production for their means of livelihood.

CHAPTER I

SCOPE OF THE STUDY

Statement of the Problem

Agricultural markets are generally characterized by various types of price fluctuations. In general, it is to the benefit of the individuals concerned to take into account such variations in prices in their decision-making process. These individuals include the producers, the consumers, the policy-makers, and practically all those directly or indirectly involved in the production, consumption, and marketing of agricultural products. Price movements include both long-term and short-term price fluctuations. The long-term price trends are important in the long-term production plans of the producer. Such information is useful for him in his decisions regarding alternative enterprises and timing of production. Cyclical and seasonal price fluctuations are a good starting point for both producers and consumers in anticipating the short-term future of prices of agricultural commodities. Awareness of irregular movements in prices as unexpected random forces arise will also prove beneficial.

The behavioral patterns of prices are a major consideration in the design and successful planning of both production and marketing of almost all kinds of commodities. In general, it is more advantageous for a farmer to plan sales to coincide whenever possible and whenever feasible with periods of high prices. Knowledge of seasonal price changes provides a basis for determining the period of production for a more profitable sale. Thus, records of past seasonal variations are important for farmers in determining the behavior of

prices in the near future so that they may be able to adjust production in order to avoid marketing in low price periods. At the same time, they will be able to recognize and take advantage of some favorable price conditions in the market that usually offer opportunities for profit. Knowledge of such price variations, therefore, is a significant factor in the decision-making process of producers in trying to attain their economic goals. These kinds of information may also be useful to policy-makers in the formulation of specific policies and programs, e.g., promotion of large feedlot operations and establishment of efficient storage systems, aimed at increasing and/or stabilizing the supply of meat and meat products. Therefore, recognition of specific behavioral patterns of hog prices may become an important device for both producers and policy-makers toward the attainment of the goal to achieve efficiency in both production and marketing and ultimately to the improvement and development of the livestock industry as a whole.

Objectives of the Study

Accordingly, the main objective of this study is to develop a proposal by which the behavior of average prices received by farmers for hogs in the Philippines can be studied and analyzed. As the importance of the knowledge of price behavioral patterns is recognized, this paper hopes that such a proposal will be instrumental in the actual study of hog prices. In order to accomplish the above objective, this study will go into the underlying specific objectives as follows:

(1) Describe cyclical and seasonal price fluctuations in certain agricultural commodities;

(2) Review the time series analysis approach;

(3) Show how such analyses can be applied to available data.

Limitation of the Study

As has been indicated, the study is simply a proposal as to how the behavioral patterns of hog prices at the point of first sale can be studied. Due to time constraint, the scope of the study has been limited to the objectives cited above. Thus, the actual manipulation of the data will not be undertaken but will be reserved for the actual study if the proposal is made an active project. Accordingly, the actual study will also incorporate the objective of describing, analyzing, and interpreting the results that may thereby be obtained.

CHAPTER II

MAJOR PRICE FLUCTUATIONS

Prices play an important role in the total market system. In fact, one may argue that the total economy revolves around the theory of prices. For an individual producer, prices of both inputs and output determine the relative profitability of his enterprise. For a consumer, they determine the relative importance of his money to satisfy his needs and desires. Therefore, to both producer and consumer, the central point of interest of their economic activities is the price. The farmer would like it to be as high as possible whereas the consumer would be happier if it would be as low as possible.

In any case, prices are determined by supply and demand relationships. Supply of the product and demand for the product are affected by a considerable number of factors. When demand and supply change, prices will accordingly change. Thus, prices are characterized by certain fluctuations or movements which may be long-term or short-term. Long-term or secular price fluctuations are those caused by long-term supply and demand conditions as affected by factors like changes in price level (i.e., inflation or deflation), population, and technology. The short-term fluctuations include cyclical, seasonal, and irregular movements of prices. Irregular movements of prices are caused by random forces such as floods, strikes, hurricanes: those that are less likely to occur at regular or predictable intervals. Unlike these irregular movements of prices, the cyclical and seasonal fluctuations are more directly observable since they are expected to occur with considerable degree of regularity and predictability.

Cyclical Price Fluctuations

Prices, therefore, are characterized by certain kinds of fluctuations as affected by the factors governing supply and demand relationships. For most farm products, prices fluctuate in somewhat regular patterns through a period of time in addition to fluctuating erratically from year to year. Livestock production and prices have more or less regular cycles. This indicates that production and prices have a tendency to move up and down over some period of years and this will happen regardless of outside forces. It can be said that the price cycle and the production cycle run opposite each other. Therefore, when production is increasing, prices are decreasing, holding other factors constant. After some time, these movements will reverse themselves such that production will decline and prices will move upward. This phenomenon constitutes what is known as the cyclical price fluctuations which characterize many agricultural commodities.

"In general, these cycles can be explained by the tendency of the producers to base tomorrow's production plans on the profits of current or recently past operations. The length of the cycle is dictated, however, by the biological nature of the commodity."[8] Thus, when hog production is relatively low and consequently, hog prices are high, producers may view the favorable earnings of the past year and may soon decide on expanding their hog enterprise. It is not uncommon that such situation may also attract other former producers back to the industry. When this happens, production will increase. To expand production, however, more gilts have to be withheld from the market for breeding purposes. Time must elapse before pigs could be born,

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[8]Richard L. Kohls, Marketing of Agricultural Products, (2d ed. rev.; New York: The Macmillan Company, 1961), p. 160.

fattened and finally brought to market. It may then take 2 or more years before the full intended expansion may be made possible. When the additional hogs are finally taken to the market, prices will be driven down. Producers then find the situation unfavorable which possibly will force them to decrease, if not totally stop, production. "Thus, these cyclical variations in production and prices result from the lag in the time required for production adjustments to be made. Since agriculture deals with living plants and animals whose biological processes can neither be speeded up nor much retarded, lags in the adjustment of production to prices is inevitable."[9] Because of this nature of agricultural production, R. F. Burdette and J. C. Abbot asserted that the important factor to the farmer hoping to take advantage of such cycles is not whether prices are "high" or "low" by any particular standards, but other farmers' intentions to expand or cut down their breeding stock in response to them.[10]

Seasonal Price Fluctuations

Prices are also characterized by seasonal fluctuations. "Seasonal variations are those that tend to follow a more or less uniform pattern within the year (i.e., a 12-month period but need not start in January) and, furthermore, conform to this pattern over a period of years. This means that peaks and troughs tend to come about the same time each year."[11] Climate and seasonal demand for various commodities are predominantly the important factors causing

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[9]Max E. Brunk and Lawrence B. Darrah, Marketing of Agricultural Products (New York: The Ronald Press Company, 1955), p. 178.

[10]R. F. Burdette and J. C. Abbot, "Marketing of Livestock and Meat," FAO Marketing Guide No. 3 (Rome, Italy, 1960), p. 147.

[11]John H. McCoy, Livestock and Meat Marketing (Westport, Connecticut: The AVI Publishing Company, Inc., 1972), p. 49.

seasonal fluctuations in prices. Since the production of certain agricultural crops is dependent upon weather conditions, there are definite periods of high and low prices. In temperate countries, for instance, pigs are farrowed in the spring and fall and are then ready for slaughter about six months later during which period supply is greater than at other times of the year. Thus, prices may decrease assuming a constant demand. Prices of cattle are usually lowest in the fall when market supplies are abundant and high in spring although such pattern may be less pronounced in most developed countries with good processing and storage facilities. But, generally, seasonal trends in prices of meat animals reflect basic seasonality in production. In Taiwan, pig production is almost continuous throughout the year and seasonal movements in prices are attributed mainly to demand factors. In rice producing areas in the Philippines, farmers tend to sell their pigs soon after rice is planted, this being the time when feed is scarce (e.g., bran) and also when farmers are in greater need for cash and selling their animals is one way of raising it. Thus, seasonal price variations may become specific for different geographic areas as defined by climate, customs and traditions, and by particular economic situations. For certain agricultural commodities and consumer goods, seasonal variations in prices are largely affected by various holidays during the year as they may influence the demand for such products.

For other agricultural commodities, particularly, fruits and vegetables, the range of seasonal variation is also attributed to their perishable nature in addition to the seasonality of their production. It is also determined by the storage, credit, and risk charges that may be involved in holding the product over time. In less developed countries, seasonal price fluctuations for these products are very pronounced because storage facilities are scarce and costly and the risk is considerable.

CHAPTER III

RESEARCH METHODOLOGY

The Time Series Approach

"Time series and trends provide a picture of change, yield knowledge of the direction of change, and show repetitive measurements (if any) in the data."[12] Thus, they represent a systematic and orderly manner of presenting, describing, analyzing, and interpreting a given set of data. "A time series may be defined as a sequence of repeated measurements of a variable made periodically through time."[13] The values or measurements correspond, therefore, to successive points of time. Thus, the average prices received by farmers for hogs measured monthly for various successive years are time series data.

The objectives of a time series analysis may take the form of one or a combination of the following:[14]

(1) Descriptive

The objective is to determine if any pattern can be observed in the changes in the magnitude of the variable in question. If any pattern in the behavior of the variable can be described the researcher may then be able to extend his study to the factors causing such behavior.

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[12]Cecil H. Meyers, Elementary Business and Economic Statistics (2d ed. rev.; Belmont, California: The Wadsworth Publishing Company, Inc., 1970), p. 445.

[13]Ibid., p. 446.

[14]Ibid., pp. 450-451.

(2) Historical

The objective is to analyze what has happened to the variable in the past in order to determine if past forces have any possible bearing in the future.

(3) Predictive

The objective is to forecast the behavior of the variable in the future given its behavior in the past and in the present with the assumption that the underlying forces will (or will not) remain unchanged.

Time series ordinarily involves at least four types of variations known as the four components of a time series: secular trend, seasonal variations, cyclical fluctuations, and random or irregular movements. Ordinarily, a time series approach would involve decomposition of the time series into its separate components. Thus, when each part is isolated, it can be analyzed and interpreted as its particular behavior is explained by the factors affecting it. It is essential, however, that each component should first be properly defined and well understood.

Secular trend:

"A secular or long-term trend may be defined as the average direction and magnitude of change in the data through time."[15] It characterizes the general pattern or behavior of the variable through time which may or may not appear in the form of a straight line. Trends are caused by persistent forces acting upon the time series that result in growth, decline, or stability of the variable. Among the factors that cause long-term trends are long-term deflation or inflation, population changes, and the shifting of consumer

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[15] Ibid., p. 452.

demands, tastes, and preferences. Trend lines are used primarily as an aid in studying other types of movements like cycles.

Cyclical fluctuations:

Cyclical fluctuations refer "to a rhythmic swing in the data brought about by regularly recurring economic conditions. . . . These cyclical forces would spread themselves over the various stages of the business cycle: prosperity, recession, depression, and revival."[16] Cyclical forces, therefore, follow a more or less regular pattern longer than seasonal change, usually 2 or more years, but shorter than secular change.

Seasonal variations:

"Seasonal changes are caused largely by weather-related conditions and customs, which repeat themselves during a period of a year or less. . . . Thus, a seasonal pattern tends to repeat itself over the same period year after year, month after month, week after week, or day after day."[17] Holidays such as Christmas, Easter, and other vacation periods contribute evident customary forces affecting seasonal behavior of most prices. Although seasonal movements may not be perfectly regular, they may exhibit a generally high degree of regularity and stability over time.

Random or irregular movements:

Random movements are those which lack any definite or systematic pattern and may be said to "just happen." Such an unanticipated forces would include inventions, changing technology, strikes, physical destruction from hurricanes

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[16]Ibid., pp. 456-457.

[17]Ibid., p. 457.

and floods, those forces which would not reoccur, at least, at predictable intervals.[18]

The Time Series Data

The time series data were obtained from the Bureau of Agricultural Economics, Quezon City, Philippines. The monthly data consist of average prices received by farmers for hogs on a per head basis. A period of six years is covered, that is, from January, 1971 to December, 1976. The data were on a regional basis (although there are some missing values in certain regions) and are categorized into two classes: (a) prices for upgraded or improved hogs and (b) prices for native hogs. Each class is further classified by age, namely: (a) hogs which are below 6 months old and (b) hogs which are 6 months old and above. If the proposed study will materialize and if analyses will be done on a regional basis, the missing values would necessarily have to be considered and if possible, data for more periods may be required in order to obtain more accurate results, particularly for trend and cyclical variations analyses.

The Time Series Model

The model of time series analysis that is most generally accepted and used is the multiplicative model. In traditional or classical time series analysis, it is ordinarily assumed that a multiplicative relationship between the four components exists, that is, it is assumed that any particular value in a series is the product of factors that can be attributed to the various

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[18] Ibid., p. 458.

components.[19] Thus, it assumes that the only absolute value is the trend component, leaving all three components as percentages.[20]

If we let

i = position of a month from 1 to n where n = 72, the total number of months of data used for this study

Y_i = original (observed) value of the time series variable (hog prices in pesos) for the i^{th} month

T_i = corresponding secular trend value

S_i = corresponding value of seasonal component

C_i = corresponding value of cyclical component

I_i = corresponding value of irregular or random component

then, according to the multiplicative model,

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

where, S_i is a per cent of T_i,

C_i is a per cent of $T_i \times S_i$,

I_i is a per cent of $T_i \times S_i \times C_i$.

Some researchers, however, take the model as additive. Thus,

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

in which case the measured value of time series is obtained by adding the four components.

For this study, the multiplicative model will be used as it has been, and continues to be, widely used in practice and it has, in many instances,

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[19] John E. Freund and Frank J. Williams, Modern Business Statistics, rev. B. Perles and C. Sullivan (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1969), p. 384.

[20] Meyers, p. 458.

provided very useful results. It should be understood, however, that "the approach to time series by way of separation into four components is undeniably oversimplified and regrettably ignores the hidden interactions and interrelationships in the data and the entire complex of individually small shifts and nuances."[21] Hence, there are other alternative approaches, like the econometric approach, which involves a large amount of advanced mathematics but which provides considerable promise in more complicated research. In spite of such inherent characteristics, the multiplicative model still provides a good base to begin one's study of time series analysis.

General Procedure of Isolating Each Component

Isolating the Secular Trend

A preliminary step before the trend movement can be isolated is to plot the original data in order to see the general behavior of the variable. This is necessary because the general shape of the plotted points will determine the method and the model that will fit the data. For this study, it is necessary to do this for the prices of each type of hogs indicated. This section, however, will review the various models that can be used as may be fitted for the general behavior of the variable.

Linear trend:

The most widely used method of fitting linear trends is the method of least squares using the simple linear regression model. That is,

$$T_i = a + bx_i$$

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[21] Freund and Williams, p. 391.

where:

T_i = computed value of the secular trend component in current pesos for a time series in the i^{th} month,

x_i = independent variable representing time units in the i^{th} month (January, 1971 = 1),

a = estimated value of Y when x = 0 or the estimated Y-intercept,

b = estimated slope of the line, a constant representing the estimated trend increment in pesos per month.

The values a and b are computed as follows:

$$b = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(Y_i - \bar{Y})}{\sum_{i=1}^{n} (x_i - \bar{x})^2},$$

$$a = \bar{Y} - b\bar{x}$$

where:

$\sum_{i=1}^{n}$ = sum of values from number 1 to n where n = 72, the total number of months,

Y_i = as defined above,

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\bar{Y} = \frac{\sum_{i=1}^{n} Y_i}{n}$$

Exponential trend:

When the plotted data appear as a curve on an arithmetic scale but as a straight line in a semi-logarithmic scale, such data exhibit an exponential curve and the exponential trend equation may be used.[22] That is,

$$T_i = ab^{x_i}$$

where:

T_i = as defined above,

a = as defined above,

b = estimated relative slope or estimated relative change in trend per unit absolute change in the independent variable,

x_i = as defined above.

For computational purposes, the equation can be transformed into a logarithmic equation, that is,

$$\log T_i = \log a + x_i \log b$$

or

$$\log T_i = a' + b'x_i$$

where:

$$a' = \log a \quad \text{and} \quad b' = \log b$$

and are estimated using the method of least squares. Thus,

$$\log a = \frac{\sum_{i=1}^{n} \log Y_i}{n} - \log b\bar{x}$$

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[22]Edward N. Dubois, Essential Methods in Business Statistics (New York: McGraw-Hill Book Company, 1964), pp. 172-174.

$$\log b = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(\log Y_i - \log \bar{Y})}{\sum_{i=1}^{n} (x_i - \bar{x})^2}$$

Taking the anti-logarithms of

$$\log T_i = \log a + x_i \log b$$

the equation is converted back from the logarithmic to the natural form and we obtain:

$$T_i = ab^{x_i}$$

Parabolic trend:

When the data exhibit a curved pattern on both arithmetic and semi-logarithmic scales, the second-degree parabolic trend method is used to derive the trend by employing the least squares method. When the data show a parabolic trend, they are either increasing at an increasing or decreasing rate, or decreasing at an increasing or decreasing rate.[23] Thus,

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

where a, b, and c are computed as follows:

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

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

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[23] Meyers, pp. 488-490.

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

and where:

x_i = time-centered position of the i^{th} month counted from the median month, i.e., the middle value of the entire time series, and given a value of zero. No median month is used since the time series has an even number of months, but counting is started from the 2 middle months. Thus, December, 1973 = -1, November, 1973 = -3, and so on, while January, 1974 = 1, February, 1974 = 3, and so on. Position of months from January, 1971 to December, 1973 carried negative signs, while months thereafter carried positive signs.

Although the study is basically a proposal (hence, there is no attempt to do the actual manipulation of the data), a preliminary analysis of the trend component was nevertheless made. This analysis is intended to provide a working example of the application of a computer programming technique to time series analysis. Partial analysis of the trend of hog prices is incorporated in the Appendix.

Isolating the Seasonal Variations

The seasonal component is measured and isolated in the form of indices known as seasonal factors or indices. "The seasonal index itself is basically a percentage, that is, the relationship between the actual periodic data and the value that theoretically would have occurred had there been no seasonal

variations."[24] The ratio-to-moving average method will be used to compute the seasonal indices since "it is probably the most generally accepted satisfactory way devised for measuring the seasonal variations . . . and it is relatively simple although it is tedious and much arithmetic may seem involved."[25]

The method consists of the following steps:[26]

(1) Calculate a 12-month moving average for the time series. This is done by taking the sum of the successive 12 months of the series, placing the total between the sixth and seventh month of the series from which this sum was obtained and dividing the sum by 12 to get the 12-month moving average. Thus, construction of the moving average causes a loss of 6 months of data at each end of the time series.

(2) But since these averages fall between each pair of months, e.g., between June and July, while the original data are measured in discrete months, it is necessary to adjust the moving average to represent each particular month. This can be done by calculating 2-month moving averages, although 24-month moving averages can be used to obtain the same result. Such process is called "centering" which results into properly centered 12-month moving averages.

(3) Divide the corresponding Y_i value by the 12-month centered moving average to obtain a ratio. This then becomes the ratio of the original Y_i value to the typical value for each month as represented by the moving average. Then, multiply all ratios by 100 for presentation in the usual index form.

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[24] Ibid., p. 494.

[25] Freund and Williams, pp. 440-441.

[26] Based upon Cecil H. Meyers, pp. 497-501.

(4) Arrange these indices in tabular form by month and year.

(5) Tabulate the indices by month and select the median value as the "typical" seasonal value for that particular month.

(6) Determine whether the total of 12 indices is 1200. Theoretically, the 12 seasonal indices would total to 1200 and have an average of 100. But since the median value (an average of position) is used rather than the mean (the average of the calculation) in each case, the 12 indices will not total exactly 1200. Therefore, an adjustment that will make the sum of the 12 indices exactly 1200 is necessary. To do this, divide 1200 by the sum of the typical (unadjusted values) to obtain an adjustment factor. Then multiply each unadjusted median by this adjustment factor to obtain the adjusted seasonal index (S_i) for each month.

(7) Finally, graph the seasonal indices by month for each time series to obtain a clear picture of seasonal changes.

Isolating the Cyclical Fluctuations[27]

Using again the multiplicative time series model,

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

the cyclical movements are generally estimated by the following technique:

(1) Estimate $T_i \times C_i \times I_i$ by dividing the original data by the seasonal index numbers for each month. This results into deseasonalized data, i.e., data in which the seasonal effects have been removed. Thus,

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[27]Based upon Frederick E. Croxton, Dudley J. Cowden and Ben W. Bolch, Practical Business Statistics (4th ed., rev.; Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1969), pp. 363-365. The technique is also known as the Residual Method as used by E. N. Dubois, "Essential Methods in Business Statistics," 1964, p. 185.

$$\frac{\text{Original Data}}{\text{Seasonal Index}} = \frac{Y_i}{S_i} = \frac{T_i \times S_i \times C_i \times I_i}{S_i} = T_i \times C_i \times I_i$$

(2) Then estimate $C_i \times I_i$ by dividing the $T_i \times C_i \times I_i$ estimates by the trend estimates for each month. Thus,

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

Since T_i and S_i have already been estimated above, steps (1) and (2) may be combined to obtain the same result. Dividing the original data by the product $T_i \times S_i$, we obtain

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

(3) The result therefore contains both the cyclical and irregular components. To get rid of the irregular component, the usual procedure is to take a five-month moving average of $C_i \times I_i$ in the hope that it will smooth out the irregular movements in the process of averaging. The moving averages can be recorded as the cyclical percentages for the cyclical component.

(4) Tabulate and/or graph the results by month and year.

Isolating the Irregular Components

The final component can be isolated and analyzed by dividing the results obtained in Step (2) above by the cyclical percentages obtained in Step (3) of the same section.[28] Thus,

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

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[28]Freund and Williams, p. 456.

Therefore, only the irregular component is left out and can be expressed as percentages. The results can be graphed and/or tabulated to show the irregular component of the given time series data.

CHAPTER IV

PRESENTATION AND SIGNIFICANCE OF RESULTS

Tabular and graphical presentations provide quite satisfactory ways of presenting the results that may be obtained. At a glance, the plotted results will reveal the general behavioral patterns of the time series data, i.e., average prices received by farmers for hogs on a per head basis. Thus, for each case, the computed values for each component can be plotted with the estimated values on the vertical axis and the time period on the horizontal axis. Tabular presentation, on the other hand, will provide a convenient method if it is desired that exact computed values be located immediately. In addition, interpretation and analysis are facilitated when results are presented in either tabulated or graphical form. Obviously, there are possible explanations for the behavior of each component. They can be obtained from either the results of past research or from public documents that provide historical facts that might possibly explain specific trends or patterns in the data. These past economic forces are important things to consider in forecasting hog prices.

When the actual study is undertaken, it is hoped that the general results will become a significant tool in projecting hog prices. For instance, trend lines may be extended into the future as the basis for long-term (say, several years) forecasting. Having obtained the regression coefficients of the equation that best fit the data, these coefficients may be used to develop projections by varying the time period (i.e., the independent variable) for specific periods in the future. However, forecasting prices based on past trends is based on the assumption that forces which have affected price

behavior in the past will continue to operate in the future periods for which projections will be made. Nevertheless, projection of prices using past trends can also be made by assuming certain changes in the future like changes in personal income, price levels, and population growth.

Although forecasting is subject to many risks of error at best, the hog producer can still benefit from the knowledge of specific price behavior as such information will aid him in the general planning of his production and marketing activities. Proper planning and scheduling of marketing activities oftentimes determine the relative profitability of any enterprise. While both long-term and short-term forecasts are important to producers, the consumers are generally more interested in shorter-term price forecasts, i.e., periods of low and high prices for meat and meat products as determined by the seasonal fluctuations in prices. For instance, based on historical data, a seasonal index of 110 per cent in August may indicate a 10 per cent increase in the projected price of hogs for August in the succeeding year. Since hog prices are affected largely by climate and seasonal demand, factors of which livestock raisers and traders have no direct control, it is up to them to study these seasonal changes and adapt to such changes the flow of market supplies. In general, much foresight and courage are required in decisions with regard to planning of livestock production and marketing operations if producers and traders want to take advantage of longer-term variations in prices. This is true for agricultural commodities in which prices are particularly affected by production cycles, as in cattle or hogs, since ordinarily, there is a long delay in the response of livestock supply to changes in price (i.e., time lag between changes in plans and changes in actual production). Although certain seasonal and cyclical fluctuations in prices follow more or less regular patterns, the task of predicting them in the future should be

coupled with due allowances for the effects of "surprise" factors such as droughts and changes in prices of substitute products. For the policy-makers, long-term projection of prices will likewise be very useful in developing more realistic long-term programs such as storage programs and more liberal credit for small producers, toward the improvement of the hog industry considering the welfare of both the producers and the consumers. They should, however, also consider in their decisions the basic assumption of forecasting although it is possible that they may have some control on certain variables in the future. However, "there is always the possibility that something unanticipated--and over which the policy-maker has no direct control--will occur and change the course of events. Thus, and in general, it may be said that the probability of unforeseen occurrences increases as the time span covered by the forecast grows longer. Control of some of the variables may decrease the uncertain element but this factor of uncertainty cannot be reduced to zero."[29] The real value of forecasting then depends upon the ability of the producers, the consumers, and the policy-makers to develop realistic projections based on past behavioral patterns of hog prices, considering the fact that more often than not, changes in the basic forces affecting prices do occur in the future.

Whereas the importance of the use of information on behavior of hog prices for the producer, the consumer, and the policy-makers has been recognized, a significant implication of the study and even those of other related studies is the question of availability of such information to the immediate users. Results of any research activity have little contribution unless they are made available to the public. Thus, efficient dissemination of market information is necessary in order that concerned individuals could make use of

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[29]Meyers, p. 454.

them. This market information may consist of commodity characteristics, location, and movement of actual and potential supplies, and analyses and forecasts of trends, cyclical movements, seasonal variations, and irregular fluctuations of prices. It is then essential that producers base their production and marketing activities on both outlook information and market news. While outlook information provides future prices and long-term trends of market values, market news usually takes into account current price situations and immediate future market supplies. These can be made available through radio market-news reports and daily newspapers. Similarly, consumers would be properly guided in their buying activities if they would have access to market information regarding past, present, and future trends in prices.

CHAPTER V

SUMMARY AND CONCLUSIONS

The livestock industry in the Philippines provides a considerable contribution in the country's agriculture. In fact, it is the most important source of animal protein for about 42 million Filipinos. It has been, and continues to be, a basic source of income for a considerable number of people. The industry, however, has been confronted with major obstacles such as production and marketing problems that have hindered the full development of the livestock industry. Such inefficiencies had been recognized and intensive programs are now being undertaken by the government to improve the industry, both in the fields of production and marketing. Efforts toward increasing the supply of meat for the continuously increasing population include research in upgrading the animals particularly in improving various breeding techniques. To achieve greater efficiency in marketing, the government has launched programs such as the implementation of a system of auction market in major livestock areas, has developed marketing cooperatives, and has established the Food Terminal, Inc. as a major terminal market for these animals. Viewing the industry as a whole, we find additional improvements are needed if the industry is to grow and to realize its full potential to the agricultural sector of the country.

Like all other commodities, prices of livestock exhibit considerable patterns and/or fluctuations. Short-term fluctuations such as cyclical and seasonal price variations are observable. It has also been noted that cycles can be explained by the tendency of producers to base tomorrow's production plans on profits of current or those of the recent past. The hog cycle

provides a concrete example of this cyclical price fluctuation. On the other hand, seasonal price variations are characterized by more or less regular patterns that occur within a year. The two factors that generally affect the seasonal price fluctuations are climate and seasonal demand for the product. Obviously, demand for pork or beef is higher during certain holidays of the year.

Recognizing the existence of such price fluctuations will generally be an important consideration in the industry's future. Thus, studies concerning price behavior will generally be relevant and useful for the producers, the processors, the traders, and policy-makers. Knowledge of price behavior is essential in the design and planning of both production and marketing of livestock. Generally, it is to the advantage of the farmer to ensure that his sales coincide where feasible with the high price periods. Thus, knowledge of price behavior is particularly important in the decision-making process of the producer in order to achieve certain economic goals. Policy programs would probably be more realistic if policy-makers would consider certain behavioral characteristics of hog prices.

The objective of this study then is to develop a proposal that will explore the study of certain behavioral characteristics of hog prices. Although the study is only a proposal, it provides a basic starting point for examining and analyzing specific behavioral patterns of prices of hogs and other related studies. The study hopes to analyze specifically hog prices but the basic methodology can generally be applied to prices of other agricultural commodities.

For this study, data are available for four types of hogs for a period of 6 years. The monthly data which are on a regional basis were obtained from the Bureau of Agricultural Economics, Quezon City, Philippines. If the

proposal becomes an active project, data for more periods might be required to obtain more accurate and conclusive results.

The heart of this proposal is the research methodology which deals with the review of the time series approach to be used. The data available are essentially time series data, hence the approach is found appropriate for the study. The objectives of any time series analysis may include one or a combination of the following: descriptive, historical, and predictive.

Basically, time series involves at least four types of variations: secular trend, seasonal variations, cyclical fluctuations, and random or irregular movements. A secular or long-term trend reveals the general pattern or behavior of a variable through time. Trends, then, may be caused by persistent forces acting upon the time series that result in growth, decline, or stability of the variable being measured. Cyclical fluctuations are brought about by regularly recurring economic conditions. Such fluctuations follow a more or less regular pattern which is longer than seasonal change but shorter than secular change. Seasonal variations are shorter-term price fluctuations that repeat themselves over the same period year after year, month after month, week after week, or may even be day after day. The last component consisting of some random or irregular movements are those that are not expected to occur, at least, at predictable intervals.

The model that has been proposed to be used for the study is the multiplicative model of the form $Y_i = T_i \times S_i \times C_i \times I_i$. The approach using this model is basically one of isolating each of the four components by specific method or technique. Preliminary plotting and visual inspection of the data is necessary to determine the type of model that can be used to study the secular trend component. Alternatives cited for fitting trend lines consist of the linear equation, the exponential equation, and the parabolic trend. To

isolate the seasonal component, the seasonal indices will be computed through the ratio-to-moving average method. The steps have been indicated in detail in an earlier section. Meanwhile, the cyclical component can be isolated through the residual method approach as discussed in the corresponding section. The irregular component which remains to be isolated can be estimated by dividing $C_i \times I_i$ by C_i, the cyclical percentages.

The results can be presented both in tabular or graphical forms. They will facilitate the description, analysis, and interpretation of the general behavior of the time series data. Results of the study can then be used as the basis for developing realistic projections of hog prices in the future. An important implication, however, is the task of making available this information to immediate users: the hog producers, the traders, and the consumers.

Essentially, the study is an attempt to develop a handy method of studying behavioral characteristics of hog prices. But, as has already been indicated, the approach is quite flexible and that analysis can be applied for prices of other agricultural commodities as well. Although the study will necessarily involve many arithmetic computations, computer programming techniques which have recently become available in the country can be used for the time series analysis approach that has been proposed.

SELECTED BIBLIOGRAPHY

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Agriculture Staff, National Economic and Development Authority. Philippine Agriculture in the Last Twenty Years. Manila, Philippines, 1975.

Brunk, Max G. and Darrah, Lawrence, B. Marketing of Agricultural Products. New York: The Ronald Press Company, 1955.

Burdette, R. F. and Abbot, J. C. "Marketing of Livestock and Meat" FAO Marketing Guide No. 3. Rome, Italy, 1960.

Cheetham, Russell J. and Hawkins, Edward K. The Philippines: Priorities and Prospects for Development. A World Bank Country Economic Report. Washington, D.C.: The World Bank, 1976.

Croxton, Frederick E., Cowden, Dudley J. and Bolch, Ben W. Practical Business Statistics. 4th ed. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1969.

Dubois, Edward N. Essential Methods in Business Statistics. New York: McGraw-Hill Book Company, 1964.

Freund, John E. and Williams, Frank J. Modern Business Statistics. Revised by B. Perles and C. Sullivan. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1969.

Kohls, Richard L. Marketing of Agricultural Products. 2d ed. New York: The Macmillan Company, 1961.

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

Meyers, Cecil H. Elementary Business and Economic Statistics. 2d ed. Belmont, California: Wadsworth Publishing Company, Inc., 1970.

National Census and Statistics Office, National Economic and Development Authority. Statistical Handbook of the Philippines. Manila, Philippines, 1976.

Rao, Potlouri and Miller, Roger LeRoy. Applied Econometrics. Belmont: California: Wadsworth Publishing Company, Inc., 1971.

APPENDIX

This appendix is an attempt to provide a working example of how a computer programming technique can be applied to the time series analysis approach that has been proposed. In effect, it serves as a preliminary analysis of the secular trend component of the historical time series data. This example makes use of the master projection computer program developed at Kansas State University by Dr. Richard Phillips. Basically, the program is a multi-purpose tool for developing projections of market potentials, market prices, production potentials, input requirements, and other items needed for development planning and feasibility analysis. The program provides alternative forms of regression models which can be used in developing specific projections.

It has been indicated earlier that there are some missing values for certain periods in certain regions, hence, the national averages have been used as input data for this example. Table 1 shows the average prices received by farmers per live animal for the different classes of hogs in current centavos. The monthly data cover a period of six years, that is, from 1971 through 1976, hence, the historical data consist of 72 time periods. In addition, the logarithmic projection model (exponential trend equation) has been used to project hog prices for 12 periods for a total of 84 time periods. Following the table proper are indicated the regression coefficients. An exponential trend is one where the rate of change of Y (dependent variable, i.e., hog prices) for each x (independent variable, i.e., time period) is constant. The results show that the rate of change is constant at 1 per cent per month. The R^2 is a measure of the proportion of variation in the dependent variable that is explained by the regression equation. A high R^2 may imply the appropriateness or the "goodness of fit" of a regression equation

for explaining the movements of a dependent variable, but a low R^2 does not necessarily imply that the regression equation is inappropriate.[30] Here the R^2 ranged from 0.68 to 0.75 for the different sets of historical data corresponding to prices of the different classes of hogs. An examination of the data will indicate that the hog prices generally exhibit an increasing trend. In addition, it can be observed that prices of upgraded hogs are significantly higher than those of native hogs considering their respective ages or the length of time they are kept by producers before they are marketed.

It has been noted earlier that the general price level may be a significant factor affecting the trend of particular time series data. Thus, to eliminate the effect of inflation from the trend, the basic data were deflated using the Philippine wholesale price indices for farm products. Thus, by using these indices as conversion factors, a series of historical data that disregard the effect of inflation was obtained and this is shown in Table 2. The same projection model was used to compute the deviations from the trend of the indexed prices. These deviations are shown in Table 3.

Inasmuch as this is only a preliminary analysis, no further analyses, such as, plotting regression estimates and interpreting the trend line, has been made. Nevertheless, this example illustrates the application of computer programming to time series analysis approach to study specific behavioral patterns of the time series data, in this particular case, the hog prices. The same technique can be used to develop specific projections based on regression estimates from historical data.

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[30] Potlouri Rao and Roger LeRoy Miller, Applied Econometrics (Belmont, California: Wadsworth Publishing Company, Inc., 1971), pp. 14-17.

TABLE 1. AVERAGE PRICES RECEIVED BY FARMERS PER LIVE ANIMAL BY MONTH PHILIPPINES. 1971-1976, WITH PROJECTIONS THROUGH 1977

(CENTAVOS/HEAD)

LOGARITHM PROJECTION

PERIOD	NATIVE HOGS		UPGRADED HOGS	
	BELOW 6 MOS. OLD	6 MOS. OLD & OVER	BELOW 6 MOS. OLD	6 MOS. OLD & OVER
1 7101	6756	11393	9343	19340
2 7102	5075	13653	9343	16892
3 7103	4250	13074	9343	17192
4 7104	4300	13814	9343	26651
5 7105	5e69	11635	7506	15160
6 7106	6140	11555	9525	17356
7 7107	5873	14350	10983	22208
8 7108	7019	13895	9937	20919
9 7109	6826	13481	8343	17794
10 7110	7952	13668	10671	19268
11 7111	5959	14650	8554	19912
12 7112	7930	15424	9924	21656
13 7201	7421	15223	11123	21274
14 7202	8495	13295	13412	19528
15 7203	7310	14911	10721	21728
16 7204	7484	14937	9877	21767
17 7205	7164	15521	12148	22392
18 7206	7952	15042	9674	22605
19 7207	7674	17227	9574	20617
20 7208	7069	16801	10452	23332
21 7209	6769	15916	8159	21826
22 7210	6065	14698	8276	20455
23 7211	5399	13655	8721	19245
24 7212	5330	13763	7821	19572
25 7301	5511	13964	8262	19453
26 7302	5109	13791	7845	19309
27 7303	5617	14723	8267	19961
28 7304	5883	15297	8687	20297
29 7305	7212	15926	10265	20647
30 7306	6574	14916	10597	20860
31 7307	7184	16000	10609	21893

Table 1
page 2

32	7308	7087	15161	10755	23635
33	7309	7493	15724	10596	23394
34	7310	7135	15059	9642	23031
35	7311	6567	15500	9572	22986
36	7312	9138	17433	13757	25302
37	7401	9774	17099	13168	26021
38	7402	10589	19533	14161	25599
39	7403	10279	20873	10611	28357
40	7404	9968	20876	11820	31115
41	7405	10162	21682	14187	34795
42	7406	8900	22882	14702	37279
43	7407	9972	24840	15157	39269
44	7408	9081	25835	15113	40711
45	7409	10330	25794	16810	40426
46	7410	10740	26080	17172	41599
47	7411	10769	26366	17086	39665
48	7412	10454	26679	17209	40475
49	7501	10342	25539	14871	40686
50	7502	10098	26493	15736	39560
51	7503	10642	26000	17360	44042
52	7504	10519	26056	17253	43859
53	7505	10616	24745	17266	39043
54	7506	10599	24860	17157	34486
55	7507	10545	24485	15713	37668
56	7508	10471	23474	15628	37699
57	7509	10591	23542	15859	35540
58	7510	10464	23610	15804	35447
59	7511	10894	22965	17439	38240
60	7512	10958	22787	17532	36921
61	7601	10736	22248	17248	35743
62	7602	9876	20370	14305	30095
63	7603	9798	20355	14083	30078
64	7604	11187	23191	16936	33474
65	7605	11074	23281	16858	33613
66	7606	11210	23307	19080	35612
67	7607	11331	23597	19068	35533
68	7608	10235	22855	21954	41326
69	7609	10260	23183	21936	41004
70	7610	10221	24192	21431	43802
71	7611	10294	24373	21895	44833
72	7612	10566	22814	18621	36829
73	7701	12115	27399	20011	44344
74	7702	12243	27698	20267	44927
75	7703	12374	28000	20526	45518

Table 1
page 3

76 7704	12505	28305	20788	46117
77 7705	12633	28614	21053	46724
78 7706	12773	28926	21322	47339
79 7707	12909	29242	21595	47961
80 7708	13046	29561	21870	48592
81 7709	13185	29883	22150	49232
82 7710	13325	30209	22433	49879
83 7711	13467	30539	22719	50536
84 7712	13610	30872	23009	51201

LCG YEAR	9.02	9.82	9.44	10.22
P(%)	0.01	0.01	0.01	0.01
RSQ	0.6751	0.7540	0.7456	0.7493
SYX	0.15	0.13	0.16	0.16
SB	0.00	0.00	0.00	0.00

SOURCE:

BUREAU OF AGRICULTURAL ECONOMICS, QUEZON CITY, PHILIPPINES

TABLE 2. INDEXED AVERAGE PRICES RECEIVED BY FARMERS PER LIVE ANIMAL BY MONTH, PHILIPPINES, 1971-1976, 1970=100

(CENTAVOS/HEAD)

LOGARITHM PROJECTION

PERIOD	NATIVE HOGS		UPGRADED HOGS	
	BELOW 6 MOS. OLD	6 MOS. OLD & OVER	BELOW 6 MOS. OLD	6 MOS. OLD & OVER
1 7101	5404	9114	7474	15231
2 7102	4059	10922	7474	13513
3 7103	3399	10459	7474	13753
4 7104	3439	11051	7474	21320
5 7105	4535	9307	6004	12127
6 7106	4911	9243	7619	13884
7 7107	4698	11479	8786	17766
8 7108	5615	11115	7469	16735
9 7109	5460	10784	6674	14235
10 7110	6361	10934	8696	15414
11 7111	4767	11719	6843	15529
12 7112	6343	12339	7939	17324
13 7201	5150	10564	7719	14764
14 7202	5895	9226	9307	13552
15 7203	5073	10348	7440	15079
16 7204	5193	10366	6854	15106
17 7205	4971	10771	8430	15540
18 7206	5518	10439	6713	15687
19 7207	5325	11955	6644	14308
20 7208	4905	11659	7253	16192
21 7209	4697	11045	5662	15147
22 7210	4209	10200	5743	14195
23 7211	3746	9476	6052	13356
24 7212	3699	9551	5427	13582
25 7301	3339	8462	5006	11788
26 7302	3096	8357	4754	11755
27 7303	3403	8922	5009	12096
28 7304	3565	9269	5264	12299
29 7305	4370	9651	6220	12512
30 7306	3983	9039	6421	12641
31 7307	4353	9695	6429	13267

Table 2
page 2

32	7308	4294	9187	6517	14322
33	7309	4540	9528	6421	14176
34	7310	4323	9125	5843	13956
35	7311	3979	9392	5800	13525
36	7312	5537	10564	8336	15333
37	7401	4202	7352	5662	11189
38	7402	4553	8395	6085	11007
39	7403	4419	8975	4562	12193
40	7404	4286	8976	5082	13375
41	7405	4369	9409	6100	14961
42	7406	3826	9835	6321	16025
43	7407	4287	10681	6517	16885
44	7408	3504	11109	6458	17505
45	7409	4441	11091	7228	17383
46	7410	4618	11214	7383	17887
47	7411	4630	11337	7346	17055
48	7412	4495	11471	7399	17404
49	7501	4136	10215	5948	16274
50	7502	4039	10597	6294	15583
51	7503	4256	10399	6943	17616
52	7504	4207	10422	6901	17543
53	7505	4246	9897	6506	15617
54	7506	4239	9943	6862	13794
55	7507	4217	9793	6285	15067
56	7508	4188	9389	6251	15079
57	7509	4236	9416	6343	14215
58	7510	4185	9443	6321	14178
59	7511	4357	9185	6975	15295
60	7512	4383	9114	7012	14768
61	7601	4079	8454	6554	13582
62	7602	3752	7740	5435	11436
63	7603	3723	7734	5351	11429
64	7604	4251	8812	6435	12720
65	7605	4208	8846	6421	12772
66	7606	4259	8856	7250	13532
67	7607	4305	8566	7245	13502
68	7608	3889	8684	8342	15703
69	7609	3898	8809	8335	15581
70	7610	3883	9192	8143	16644
71	7611	3911	9261	8320	17036
72	7612	4015	8669	7075	13995

SOURCE:

BUREAU OF AGRIC. ECONOMICS, QUEZON CITY, PHILIPPINES
WHOLESALE PRICE INDICES FROM UN STAT. YEARBOOK, 1975

TABLE 3. DEVIATIONS FROM TREND OF INDEXED AVERAGE PRICES RECEIVED BY FARMERS PER LIVE ANIMAL BY MONTH,PHIL.,1971-76

(CENTAVOS/HEAD)

LOGARITHM PROJECTION

PERIOD	NATIVE HOGS		UPGRADED HOGS	
	BELOW 6 MOS. OLD	6 MOS. OLD & OVER	BELOW 6 MOS. OLD	6 MOS. OLD & OVER
1 7101	1543	546	1994	3413
2 7102	175	2301	1950	1596
3 7103	-507	1785	1906	1736
4 7104	-490	2324	1861	9202
5 7105	582	526	346	-92
6 7106	935	408	1916	1562
7 7107	699	2590	3037	5341
8 7108	1592	2171	1674	4205
9 7109	1414	1785	833	1600
10 7110	2291	1880	2838	2674
11 7111	673	2609	938	3082
12 7112	2225	3173	1957	4369
13 7201	1008	1342	1689	1700
14 7202	1728	-52	3229	379
15 7203	882	1012	1313	1795
16 7204	977	973	678	1711
17 7205	730	1320	2205	2033
18 7206	1252	930	438	2067
19 7207	1034	2388	319	573
20 7208	589	2033	877	2342
21 7209	356	1360	-764	1181
22 7210	-157	455	-735	112
23 7211	-646	-328	-477	-844
24 7212	-718	-313	-1155	-737
25 7301	-1104	-1462	-1629	-2651
26 7302	-1374	-1628	-1933	-2805
27 7303	-1093	-1125	-1732	-2586
28 7304	-957	-840	-1531	-2506
29 7305	-179	-520	-629	-2417
30 7306	-593	-1194	-483	-2413
31 7307	-250	-601	-530	-1914

Table 3
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32	7308	-336	-1172	-498	-936
33	7309	-117	-895	-650	-1260
34	7310	-361	-1362	-1295	-1612
35	7311	-733	-1160	-1385	-1767
36	7312	797	-52	1093	-495
37	7401	-565	-3330	-1638	-4771
38	7402	-242	-2348	-1270	-5087
39	7403	-405	-1838	-2856	-4036
40	7404	-566	-1904	-2395	-2986
41	7405	-511	-1538	-1437	-1541
42	7406	-1083	-1175	-1276	-612
43	7407	-651	-401	-1141	104
44	7408	-1063	-41	-1221	583
45	7409	-555	-127	-553	319
46	7410	-408	-73	-480	680
47	7411	-425	-20	-560	-295
48	7412	-590	44	-570	-52
49	7501	-979	-1282	-2085	-1368
50	7502	-1106	-970	-1803	-1807
51	7503	-919	-1239	-1219	-323
52	7504	-959	-1288	-1326	-547
53	7505	-990	-1885	-1387	-2624
54	7506	-1028	-1911	-1498	-4600
55	7507	-1081	-2134	-2142	-3481
56	7508	-1141	-2612	-2243	-3625
57	7509	-1125	-2658	-2219	-4646
58	7510	-1207	-2706	-2310	-4841
59	7511	-1067	-3038	-1725	-3883
60	7512	-1073	-3184	-1757	-4571
61	7601	-1409	-3920	-2285	-5919
62	7602	-1768	-4710	-3475	-8229
63	7603	-1830	-4792	-3650	-8400
64	7604	-1334	-3791	-2618	-7276
65	7605	-1410	-3835	-2705	-7391
66	7606	-1392	-3903	-1949	-6800
67	7607	-1379	-3871	-2027	-7001
68	7608	-1829	-4232	-1005	-4972
69	7609	-1853	-4187	-1086	-5267
70	7610	-1502	-3883	-1354	-4379
71	7611	-1903	-3895	-1253	-4163
72	7612	-1838	-4568	-2574	-7382

SOURCE:

BUREAU OF AGRIC. ECONOMICS, QUEZON CITY, PHILIPPINES
WHOLESALE PRICE INDICES FROM UN STAT. YEARBOOK, 1975

A PROPOSAL TO STUDY THE BEHAVIOR OF HOG PRICES IN THE PHILIPPINES

by

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AN ABSTRACT OF A MASTER'S REPORT

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The livestock industry in the Philippines contributes significantly to the value added in the agricultural sector of the country. Being an important source of animal protein for the Filipinos and a basic source of income for a considerable number of people, the full development of the industry is undoubtedly one of the major priorities in the entire development program of the agricultural sector.

Since prices are an important component of the total market system, in general, a study of the behavioral characteristics of hog prices will prove useful in the efforts to improve the livestock industry of the country as a whole. Thus, this study is an attempt to develop a proposal that will explore an examination of the behavioral patterns of hog prices in the Philippines.

The hog prices, in common with those of many agricultural commodities, exhibit considerable movements over time. These movements generally include secular trends, cyclical fluctuations, seasonal changes, and random or irregular movements. To take into account each of these movements, the proposed approach is the method of time series analysis which considers the multiplicative model of the form $Y_i = T_i \times S_i \times C_i \times I_i$. Basically, the time series analysis approach is one which disaggregates the time series data, i.e., the hog prices, into each of the four components. This study considers the different techniques of isolating these different components. The simple linear equation, the exponential trend equation, and the parabolic trend equation were considered as alternative forms of regression models which can be used for studying the secular trend component. To isolate the seasonal component, the seasonal indices will be calculated using the ratio-to-moving average method. The residual method will be used to determine the cyclical movement. Although the random movements of prices are highly unpredictable,

an attempt will be made to isolate this final component by dividing the combination of the cyclical and irregular components by the cyclical percentages. Results will be presented in both tabular and graphical forms to facilitate analysis and interpretation.

If the proposal becomes an active project, specific price movements will be identified, measured, described, recorded, and interpreted so that results in effect can be used as a significant tool in projecting hog prices. Thus, the real value of the study will be its contribution in providing a starting point in developing price projections for the benefit of the immediate users. Although developing and/or using projected prices take(s) into account certain risks of unforeseen occurrences in the future, forecasting and knowledge of specific price movements will still be useful to hog producers and traders. In general, they will aid these individuals in developing and planning their over-all production and marketing strategies for better returns from their business. Short-term price forecasts, particularly seasonal forecasts, will guide consumers in their buying activities. Similarly, it is desirable that policy-makers consider price movements in developing specific programs, such as credit and storage programs, toward achieving greater efficiency in both production and marketing. Due allowances, however, should be accounted for since prices in the future will be largely influenced by the different factors affecting future demand and supply relationships.