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Seasonality in Market Prices of Livestock Products in Ibadan Metropolis

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Target audience: Livestock economist, policy makers, poultry producers and Marketers.

Abstract

The myriads of problems confronting the agricultural sector in general and the livestock industry in particular is hardly seen from the effect of efficient marketing structures for its products especially in relation to price behaviour over time. This study thus examined the trend of seasonality in the market prices of some selected livestock products in Ibadan Metropolis. Time series data on monthly prices of beef, chicken, egg and milk which spanned a period of seventy - two months (1992 - 1997) were analyzed using a dis-aggregated time trend analysis.

Results showed a high degree of fluctuations and a general increase in prices. Seasonal and a general trend analysis showed that highest prices were recorded for these products during seasons of major festivities such as Christmas and Eid-el-kabir. The study also revealed pronounced cyclical and irregular price behaviour.

Therefore, since prices are directly or indirectly affected by market, structures particularly transportation and storage, improved marketing structure in general and transportation aids, storage facilities in particular are recommended in order to stabilize livestock prices.

Key words: Seasonal index, Deseasonalisation, cyclical and Irregular movement.

Description of Problem

In Nigeria, just as it is in many other countries of the world, livestock production is an integral part of the farming systems. The importance of the livestock sub-sector has gone beyond the primary role of providing protein of animal origin to appreciable contribution to employment generation and the Gross Domestic Product (GDP) among others.

The significance of the livestock sub-sector to the national economy in capital value was estimated at about N5 billion before the Structural Adjustment Programme (SAP) in 1986 (1). It contributed about 5 percent to the GDP and about 20 percent of the agricultural GDP.

However, the contemporary levels of animal production has become very low in the past few years, consequently, there is a disturbing and noticeable shortage of animal protein in the diet of average Nigerians (1). This arises from the shortfall in the supply of meat of the various livestock to meet the increasing demand of the ever increasing population.

Various problems have been adduced to be responsible for the under-performance of the livestock sub-sector. These ranged from technical to social, economic and institutional problems. The technical problems include the prevalence of traditional pastoralism and subsistence mode of production among others. The social and economic problems concern the impediments to commercialization and modernization of the livestock industry and lack of sufficient capital, credit and other production pre-requisites (2).

In the area of the demand for and the supply of livestock products, seasonal price variation has been a critical factor. Studies on seasonal price

variations could be of considerable assistance to livestock producers, marketers, consumers, and other stakeholders (such as financiers) who need such information for one reason or the other. For example, seasonal index of prices is useful for making short-range price forecast as well as projection of the seasonal price into the future. It was against this background that this study was undertaken. The study specifically estimated the trend of price fluctuations and obtained seasonal indices of prices of four livestock products: beef, chicken, egg and milk in the city of Ibadan, the Oyo State capital.

Conceptual Framework/Literature Review

Time series analysis was used to establish price behaviour of four livestock products in Ibadan Metropolis.

A time series is a set of observations taken at specified time usually at intervals. The observed values could be that of prices, values of output, or input among others for a sequentially ordered series of time period.

Mathematically, a time series is defined by the values:

Y1, Y2, ...YN of a dependent variable e.g price at times t1, t2 ..... tN. Thus Y is a function of t symbolized by Y = f(t). The basic component, are being the deterministic and the random components. The deterministic component may be further decomposed into seasonal and non-seasonal components.

Four characteristic movements or components of time series can be identified:

(i) The Secular movement which shows a general direction of movement indicated by a trend curve or trend line.

(ii) Cyclical movement/variation which is a long term oscillations or swings about a trend line or curve.

(iii) Seasonal variations is an identical or an almost identical pattern which time series appear to follow during corresponding months or successive years.

(iv) Irregular or Random movements refers to the sporadic motion of time series due to chance events. Thus, analysis of time series consists of an investigation of the factors T, C, S and I, that is; Trend, Cyclical, Seasonal and Irregular or Random effects.

Several studies on time trend analysis have been carried out in the past particularly on prices of crops to examine cyclical price variations in Nigeria. (3) used the analysis of cyclical price variation to study change in supply - demand equilibrium of grains over time. The result of analysis of seasonal price variation showed the degree of supply - demand disequilibrium during the years studied. (4) in her study on the characteristics of agricultural product prices indicated that prices, besides fluctuating seasonally in an irregular pattern also exhibit an up and down cyclical movements. She concluded that agricultural product prices are characterized by inconsistencies due to the method of fixing such prices in the market.

Trend in the rural market retail prices of selected crops were observed to be mixed with a substantial increase inspite of the good harvests, (5). The price increases were attributed mainly to rising costs of production and transportation. The Federal Office of Statistics (6) also observed that the trend in price movement was similar in both rural and urban areas and in all commodities. (2) analyzed the impact of Structural Adjustment Programme on the Nigerian livestock industry. The results showed an upward trend in prices of livestock product. (7) in a cointegration and error correction modeling of livestock population in Nigeria showed that a positive relationship exists between livestock prices and output.

The present study employed a disaggregated time trend analysis to estimate fluctuations in livestock product prices of beef, chicken, egg and milk in other to elicit a policy direction towards efficient pricing for the livestock product.

Materials and Methods

Secondary data on average monthly prices of livestock products of beef, eggs, chicken and milk in Ibadan Metropolis for a period of six years (1992 - 1997) were obtained from the Federal Office of Statistics.

Analytical procedures include the following: descriptive analysis, moving average, (smoothing

of time series), deseasonalisation of data, (seasonal index) and cyclical variation. The basic assumption is that the time series variable is composed of:

$$Y = TCSI$$

Where:

T = Trend effect

C = Cyclical effect

S = Seasonal effect and,

I = Irregular or Random effect

Estimation of Seasonal Variation (Deseasonalization Procedure)

The procedure was used to estimate how the data in the time series varies from month to month throughout a given year. It was determined to show the relative values during the month of the year.

The procedure involves dividing the original monthly data by the corresponding seasonal index of the corresponding month for each specified product. The seasonal index was obtained using the average percentage method.

Seasonal Index

The average percentage method used in determining the seasonal index involves expressing the data for each month as a percentage of the average for the year.

Thus: $$S = \frac{R}{\bar{I}} \times 100$$

where:

S = Seasonal Iindex

I = Monthly average for the year

R = Monthly values

Adjusting for Seasonal Variation (Deseasonalisation)

The original monthly data were divided by the corresponding seasonal index of the corresponding month for each livestock product.

This is given by:

$$\frac{Y}{S} = TCI$$

In this way, the data have been adjusted for seasonal variation.

Cyclical and Irregular Estimation

The cyclical /irregular estimation were estimated after the data have been deseasonalised. They were adjusted for trend values for each product obtained by the method of moving averages. Adjusting for trend reduces the level of fluctuation over time.

In the moving average employed, the 72 months data were adjusted for 12 months, that is, the first and the last six months. Theoretically therefore, The adjusting for trend accounted to dividing the deseasonalised data by T. Thus:

Results And Discussions

Trend/Pattern of Livestock Product Price

The average monthly prices of the various livestock product are presented in Table 1.

From Table 1, the highest average price for beef was in 1997 (₦129.01/kg) and the lowest average price was in 1992 (₦30.85/kg). This connotes a 318.2 percent increase in price between 1992 and 1997. Lowest average price of ₦56.35 was also recorded for chicken in 1992. It had the highest price of ₦276.78 in 1996 representing 391.2 percent.

Table 1: Average Monthly Prices of Livestock Products

	1992	1993	1994	1995	1996	1997
Beef	30.85	50.00	81.13	107.84	126.89	129.01
Chicken	56.35	62.69	173.28	263.00	276.78	264.16
Eggs	17.9	34.26	46.03	67.66	85.89	87.90
Milk	6.87	11.96	21.74	29.30	37.65	36.87

Source: Computed from the FOS data.

There was an upward trend in prices of eggs and milk throughout the period studied. The lowest average price for eggs was in 1992 (₦17.90/dozen) and the highest was ₦87.90/dozen in 1997. For milk, the lowest price was ₦6.87 per tin, in 1992 and the highest (₦37.65) in 1996. These increases, represent 391.1 and 446.4 percent, for egg and milk respectively.

The observed general price increases for the various livestock products could be attributed to various factors, such as the continuous relative decrease in production and transportation cost. Generally, the depreciation of the naira and the general under performance of agriculture resulting from years of neglect may have given rise to escalating costs of feed and feed ingredients either produced locally or imported.

Seasonal Price Variations (Seasonal Index)

Table 2 shows the seasonal variation in prices of beef from January to December throughout the period of study.

The variation in prices of beef followed an almost same pattern across the months. Increases were observed in the month of March, June and in December for most the years studied. Exceptions were in 1994, 1996 and 1997 when prices rather than increase, decreased in the month of march. The same marginal decrease was observed when price index fell from 131.55 in November to 126.56 in December 1993. For the rest of the months within a given year and across the years seasonal variations were diffused.

Demand for beef mainly during festivities such as Easter, Christmas, Eid-l-Kabir around the months of March, June and December were major causes of price increase around these periods. Economic conditions in the country at one time or another which affects production (supply) and the purchasing power of the consumers could have been responsible for the price variation.

Table 2: Estimation of Seasonal Prices Index for Beef (1992 - 1997) in Ibadan Metropolis

	1992	1993	1994	1995	1996	1997
January	95.34	45.93	82.99	105.88	100.88	106.19
February	95.37	60.39	88.04	93.56	105.08	93.79
March	144.94	85.05	81.96	110.29	98.51	93.79
April	90.78	62.16	75.89	108.39	84.87	91.50
May	118.32	99.34	97.49	100.67	98.97	102.58
June	145.88	114.17	108.89	110.95	99.67	78.19
July	61.75	98.95	100.31	99.92	105.35	94.81
August	78.48	112.31	91.73	56.20	99.26	97.98
September	6837	127.36	95.59	81.36	102.46	101.16
October	99.91	136.55	117.26	106.52	103.27	107.84
November	95.44	131.55	123.80	111.28	100.84	113.34
December	105.45	126.56	136.13	114.99	100.84	118.84

Source: Estimated from FOS (1997) monthly price for Beef

Table 3 shows the estimation of seasonal price indices for chicken in Ibadan metropolis of Oyo state.

Seasonal price index for chicken reveals a relatively higher prices from January to June

compared to June towards December for the years studied. Exception was in 1997 when prices were almost stable throughout the year. Prices were however relatively low for other years within the same month.

On the other hand, prices were relatively high within January and June, with some exceptions in the month of January and February in 1994 and 1995 as well as April in 1992.

Generally therefore, prices of chicken follows a regular pattern with slight increases between January and June and lower prices from June before it picks up by December. Thus confirming the expected price increase during the Christmas New Year period.

Table 4 shows the estimation of seasonal price index for eggs in Ibadan Metropolis from 1992 - 1997.

The variation in prices of eggs did not follow the pattern for beef and chicken. Prices rose in February except in 1996 and 1997. Prices was relatively stable in 1996 at an average index of 98 while it fell from 100-88 in January to 95.44 in February, 1997. Price increase also occurred between April and June and the fluctuations were more pronounced from July to December.

The basic reason for price fluctuation of eggs could be adduced to variation in production (supply) which is commonly affected by Weather conditions which varies across the year.

Table 3: Estimation of Seasonal Index Prices of Chicken 1992 - 1997 in Ibadan Metropolis

	1992	1993	1994	1995	1996	1997
January	106.47	127.08	94.55	94.30	112.00	112.81
February	88.72	135.59	88.01	83.65	72.26	112.81
March	196.52	136.59	108.39	110.27	105.45	112.81
April	70.98	130.61	108.17	111.41	138.65	113.57
May	118.89	156.35	111.96	110.27	138.65	80.25
June	88.72	161.68	115.81	114.07	96.20	116.41
July	72.75	50.57	88.49	104.54	98.20	101.67
August	80.96	55.67	64.89	72.24	98.20	101.67
September	82.62	57.43	95.21	88.40	90.52	101.67
October	85.83	59.66	86.56	104.56	98.20	101.67
November	91.80	63.80	110.93	105.51	89.31	82.11
December	116.58	64.97	127.02	100.76	77.72	62.55

Source: Estimated from FOS (1997) monthly price for Chicken

Table 4: Seasonal Price Index of Eggs 1992 – 1997 in Ibadan Metropolis

	1992	1993	1994	1995	1996	1997
January	100.56	80.77	80.79	73.10	97.80	100.88
February	104.75	107.28	97.76	100.70	97.80	95.44
March	82.51	87.81	102.47	97.74	97.80	95.44
April	120.11	87.57	37.65	104.93	97.99	95.19
May	127.82	88.54	103.19	90.15	111.21	94.29
June	134.08	103.74	101.39	103.46	111.21	94.29
July	85.64	92.53	104.28	95.79	96.40	93.52
August	84.92	101.88	104.28	96.07	95.88	102.12
September	89.39	105.09	97.76	96.07	97.74	110.72
October	89.39	109.17	104.10	105.48	96.75	110.72
November	83.80	116.76	126.12	123.41	99.81	102.58
December	97.04	118.87	130.35	112.32	99.81	94.43

Source: Estimated from FOS (1997) monthly price for eggs.

Seasonal index for milk reveals some levels of fluctuations and stability in some years (Table 5). Generally, increases were observed between October and December except in 1997. Prices were stable for some months across the years particularly between February and June. While price was stable from January to June in 1994 at 88.14, it was 99.19 and 95.62 between May-June and March – April in 1992 and 1993 respectively. It was equally stable between February March and July – September in 1995 and 1997.

The relative stability in the prices of milk (though price increase were observed), this point to the fact that supply of milk for the period studied relatively marches demand irrespective of the period of a given year. The increases observed towards the end of he year could simply be due to increased intake of milk with other beverages during the rainy season.

Table 5: Estimation of Seasonal Index Prices of Milk 1992 – 1997 in Ibadan Metropolis

	1992	1993	1994	1995	1996	1997
January	87.39	69.63	88.14	97.19	79.68	102.52
February	87.39	73.14	88.14	94.01	99.60	97.50
March	99.48	95.62	88.14	94.01	100.93	97.50
April	94.67	95.62	88.14	97.77	92.30	103.44
May	99.19	86.93	88.14	95.38	120.11	99.67
June	99.19	92.53	88.14	93.26	95.17	96.28
July	98.31	96.21	87.40	96.61	94.02	102.03
August	98.31	111.34	85.10	95.75	94.04	102.03
September	98.31	116.52	89.70	97.46	97.34	102.03
October	111.13	117.44	115.00	102.37	97.13	94.93
November	110.11	121.96	142.05	112.41	134.50	94.93
December	116.52	123.04	166.75	112.32	95.17	107.13

Source: Estimated from FOS (1997) monthly price of Milk

4.3: Deseasonalization of Livestock Product Prices

Table 6: Deseasonalised Data for Beef, Chicken, Egg and Milk

YEARS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT.	OCT.	NOV.	DEC.
BEEF												
1992	32.85	32.94	43.65	32.71	35.47	41.05	20.37	27.10	27.54	27.54	26.12	27.77
1993	25.63	33.59	41.49	36.29	48.24	52.04	52.88	62.83	60.98	60.98	58.32	54.00
1994	75.21	79.98	64.93	71.93	76.87	80.59	87.03	83.31	85.03	85.03	89.12	94.29
1995	127.53	112.97	116.12	136.56	105.50	109.14	115.22	67.84	102.66	102.66	106.47	105.86
1996	142.96	149.28	122.04	125.81	122.05	115.36	142.94	141.00	117.11	117.11	113.53	109.24
1997	153.01	135.48	118.14	137.90	128.61	92.01	130.80	141.51	124.34	124.34	129.73	130.88
CHICKEN												
1992	55.62	51.63	86.30	36.64	56.12	43.30	47.65	59.21	54.16	54.10	57.12	71.73
1993	73.86	87.77	66.72	72.96	82.10	87.77	36.84	45.78	41.87	41.83	44.16	44.46
1994	151.88	157.48	146.34	167.01	162.49	173.78	178.23	147.50	191.91	167.76	212.21	240.29
1995	229.91	227.18	2275.96	261.07	242.89	259.78	319.62	249.23	270.42	307.56	306.37	289.30
1996	287.39	206.53	227.43	241.93	321.41	230.56	315.88	300.76	291.40	303.96	272.91	234.83
1997	276.26	307.73	232.20	267.31	177.57	266.28	312.14	352.29	312.38	300.37	239.46	180.37
EGG												
1992	19.86	18.64	15.72	23.75	22.31	21.87	16.19	15.58	16.09	15.57	13.79	15.96
1993	30.54	36.52	32.01	33.13	29.58	32.38	33.48	35.79	36.20	36.40	36.78	37.43
1994	45.61	44.72	50.20	19.14	48.33	42.52	50.69	49.22	45.24	47.04	53.38	55.15
1995	55.18	67.71	70.83	78.42	59.49	63.78	68.44	66.65	65.35	69.46	76.79	69.85
1996	92.70	83.48	89.40	92.77	93.16	87.03	87.44	84.44	84.41	80.88	78.84	78.79
1997	98.85	83.37	89.28	92.41	80.83	83.82	86.81	92.04	97.85	94.71	82.91	79.29
MILK												
1992	6.86	6.67	7.12	6.82	6.93	7.24	7.05	6.90	6.73	7.18	6.34	6.69
1993	9.53	9.73	11.92	12.00	10.59	11.76	12.02	13.62	13.91	13.21	12.23	12.31
1994	21.92	21.30	19.97	20.10	19.51	20.37	19.84	18.92	19.46	23.51	25.88	27.60
1995	32.58	30.63	28.72	30.06	28.46	29.05	29.56	28.70	28.49	28.21	27.61	30.32
1996	34.31	41.68	39.60	36.45	46.03	38.08	36.97	36.21	36.57	34.39	42.44	29.97
1997	43.23	39.95	40.01	40.01	37.41	37.73	39.28	38.48	37.53	32.91	29.33	33.04

Source: Computed from the FOS data.

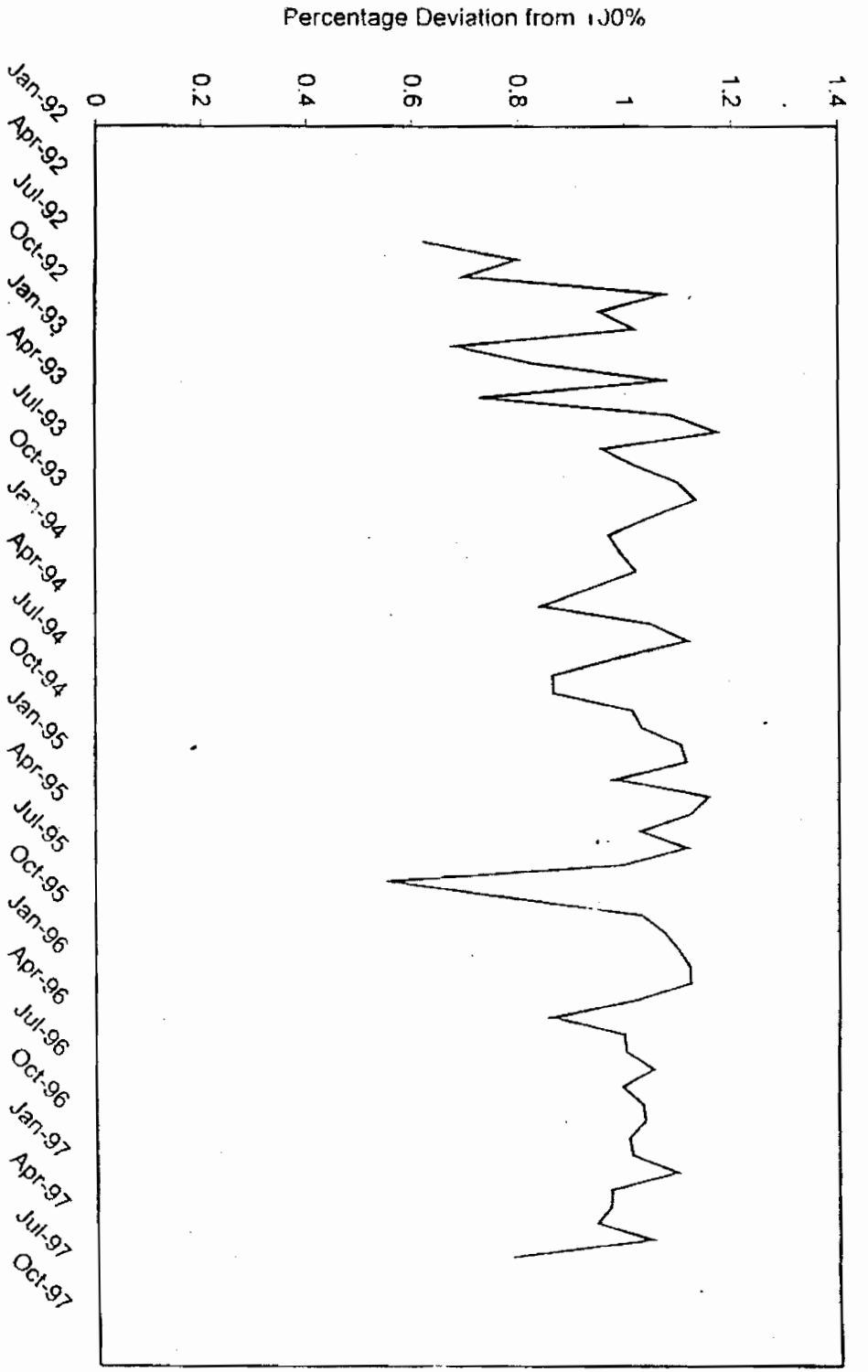

Figure 1: Estimation of Cyclical and Irregular Price Variation of Beef

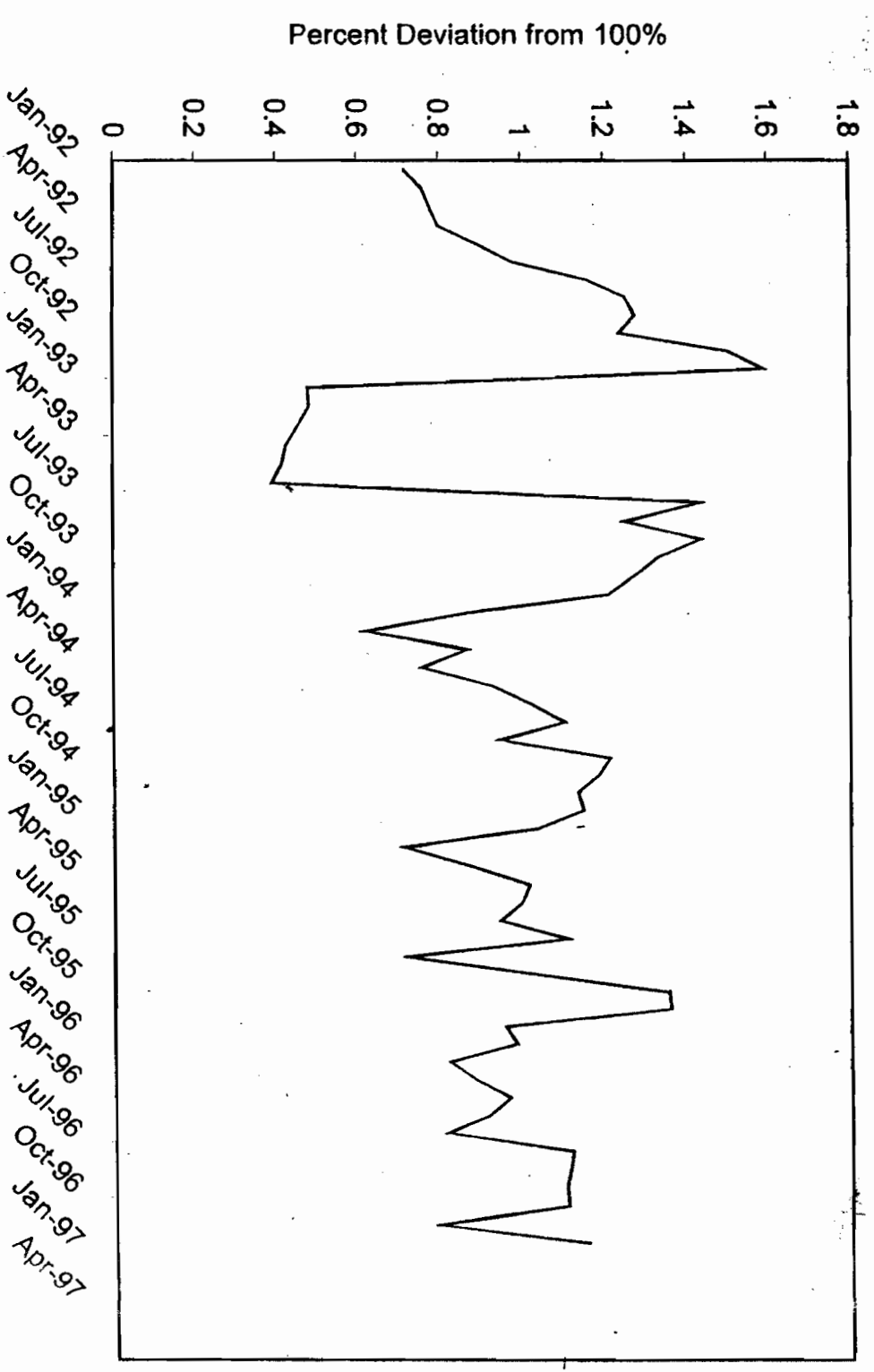

Figure 2: Estimation of Cyclical and Irregular Price Variation of Chicken

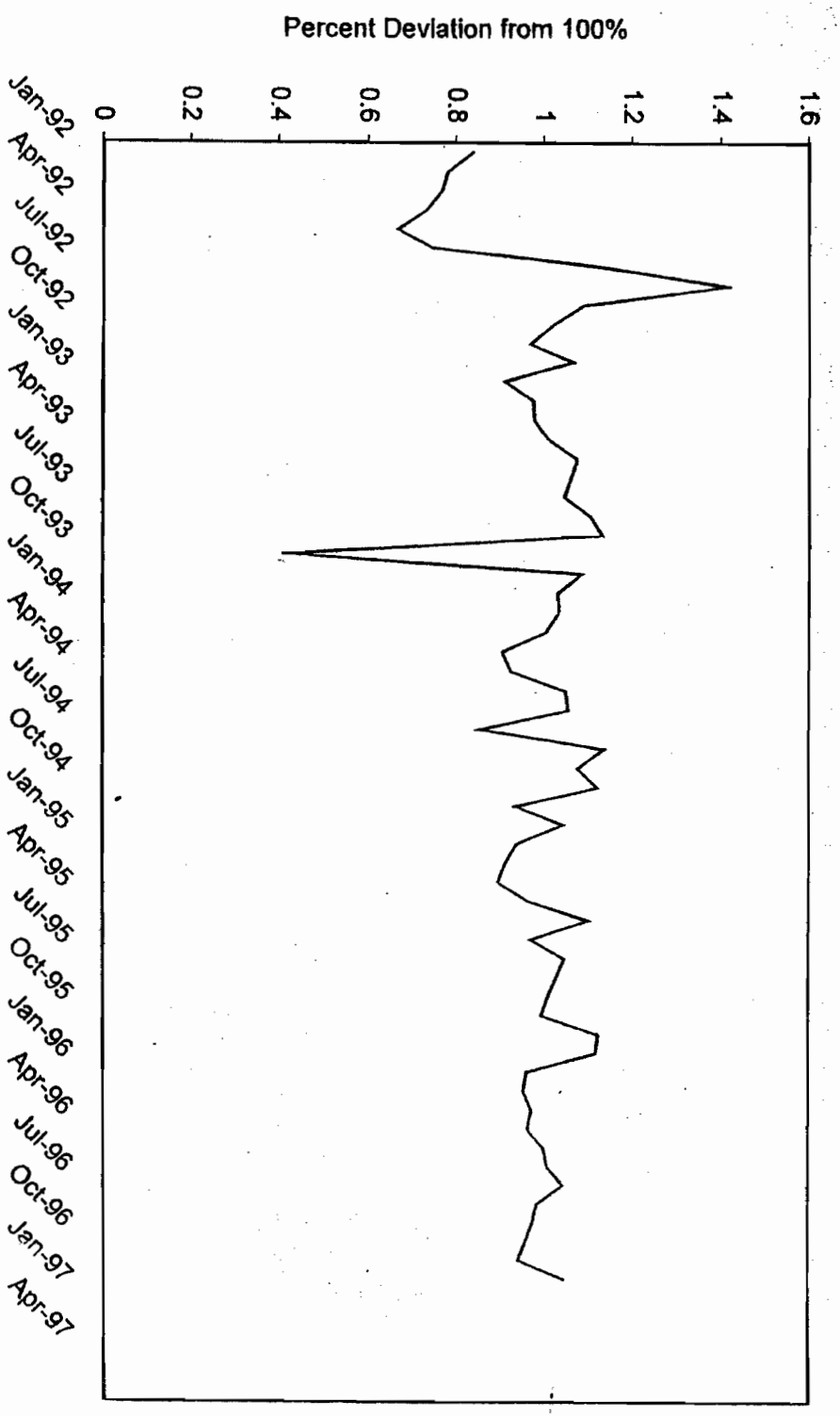

Figure 3: Estimation of Cyclical and Irregular Price Variation of Eggs

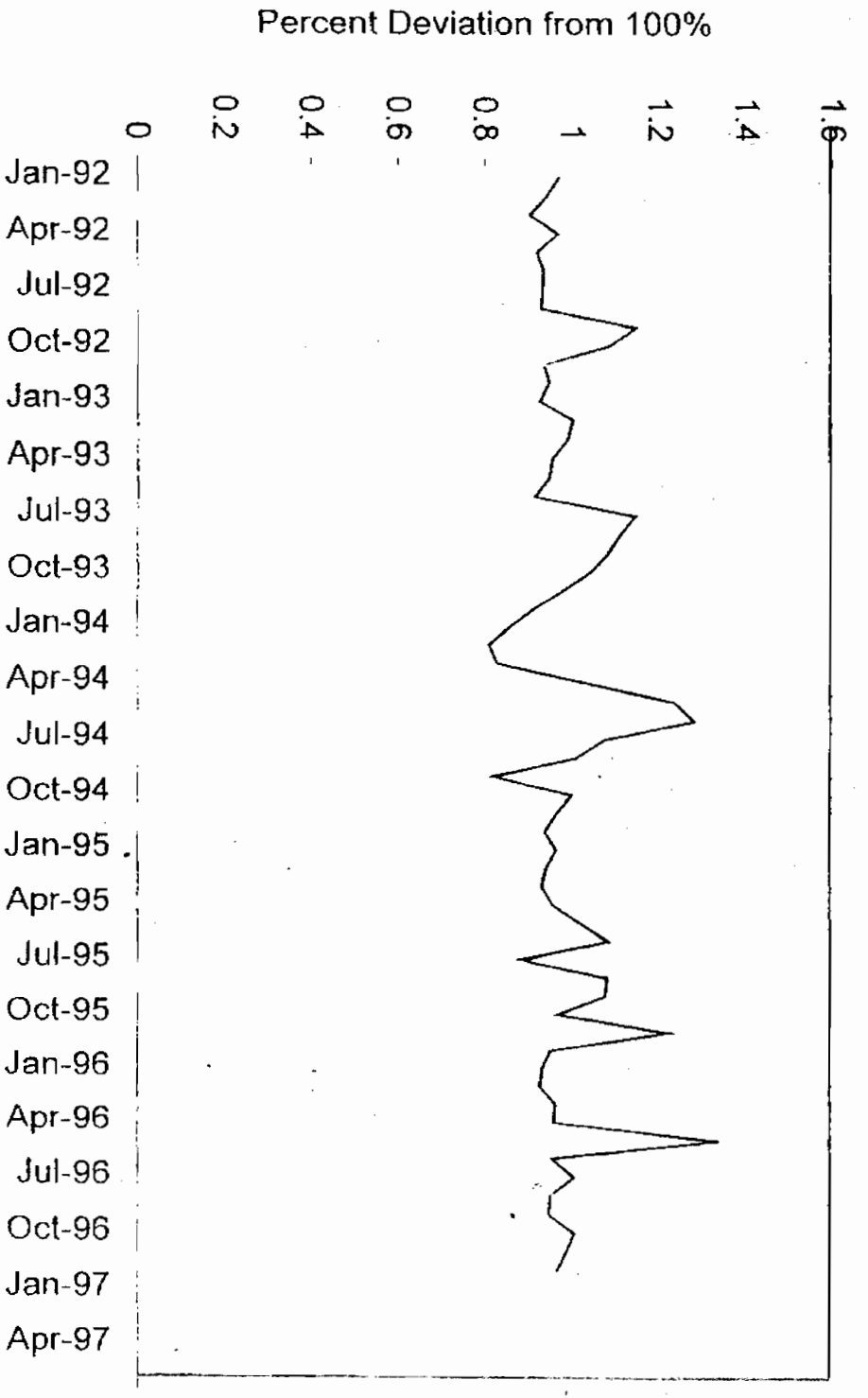

Figure 4: Estimation of Cyclical and Irregular Price Variation of Milk

From table 6, result of the deseasonalised data for beef shows an upward and downwards effects of price from January to December. In 1992 for instance, there was a gradual increase between January and March from 32.85 to 43.65, only to decline in April to 32.71, increase to 41.55 by June and fall to a low value of 20.37 in July. It was relatively stable thereafter.

The downward effect could be due to heavy and increased supplies which caused prices to fall while the upward effect of price could be due to increasing demand as a result of increasing population. Increases in real income, tastes and preferences are some other probable reasons for the upward effect.

The same upward and downward effect was observed for chicken. The high price could however be as a result of seasonal events such as Christmas and Eid-el-kabir, other reasons could be due to high cost of production and transport.

Throughout the years studied, an upward and downward effects were observed on price of eggs. There were sharp increases which could be as a result the effect of high inflation rate in the economy. The same effect was observed for milk just as it is for eggs.

Cyclical And Irregular Estimation

There was a fair and low cyclical and irregular variations from 1994 to 1995 for beef. The cyclical and irregular variation graph (Fig 1) started with a negative deviation and further characterized by a very sharp and pronounced deviation from the zero line especially in 1992 and 1993. High transportation cost occasioned by incidence of fuel scarcity in the country around this period which could have resulted into low economic activity in the country are some reasons for the deviations.

Cyclical and irregular estimation for chicken follow almost the same pattern. This is evidenced in the various negatively high peaks recorded as compared to positive peaks. The years 1993 and 1994 showed pronounced the negative peaks.

The irregular positive and negative variations for egg were almost equal. The pronounced negative peaks in late 1992 and early 1994 however is an indication that overall performance of the economy around these periods affected the demand for and the supply of eggs.

The above scenario were equally observed for milk. This, however, occur between 1993 and 1994.

The various scenarios for beef, chicken, egg and milk are graphically represented in figures 1 to 4.

Conclusion and Applications

Prices of agricultural products are characterized by several factors prominent among which is the seasonal effect. This study thus captures the seasonal effect as well as the effect of the general performance of the economy through the time trend analysis of the price series of four selected livestock products.

The result from this study confirmed that there were marked fluctuations in prices of the four livestock products investigated throughout the selected years in the study area.

Therefore, it has been established that as a peculiarity of all agricultural produce, livestock products are equally affected to a great extent by seasonal variations. The demand for and the supply of these products have been greatly determined by seasonal factors. To these effects, the need to strike a balance between the demand and supply of livestock products in order to provide the teeming population the required level of protein irrespective of the season of the year becomes imperative. The task will not be left for government alone but all stakeholders must equally intervene particularly in areas of transport and storage facilities.

The following recommendations are therefore made based in findings.

(i) Transport facilities; transport cost accounts for a significant share of marketing costs particularly during festive periods. This is one area government need to be involved more in maintenance of available transport facilities with special attention paid to improving the quality of vehicle and also construction of a more standard feeder roads.

(ii) Market information centers; it is recommended that government should establish market information centers in some of the big cities and should involve information regarding stock, impending supply and prices, this will

enable the farmers or traders to sell and buy in the best markets to obtain the greatest margin.

(iii) Market research; market research is important in the areas of food storage and preservation techniques, consumer demand, tastes and preferences, processing handling and packaging. These will go a long way in price stabilization irrespective of season.

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