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Analysis of food price movement in Nigeria: Focus on price behaviour in Oyo State

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Abstract

Market prices for rice, maize and gari, which account for 70% of the food commodities traded and consumed in Oyo State of Nigeria, were analysed for the period, 1968–1981. Retail market prices were found to follow a rapidly increasing trend. This led to a quantitative assessment of the probable influences on price changes. Results on such influences show that last season's (immediate past) prices and the quantity of money supply (evidenced in per capita current income) have a major influence on the current level of prices. On this basis, policy recommendations were made with respect to satisfying consumers' demand especially regarding effort to make staple foods available at the right time and at reasonable prices.

Introduction

In recent years, a growing concern with staple food marketing appears to be developing throughout most of tropical Africa. In these areas, food prices are very unstable, and available evidence suggests that they have a highly significant effect on the general price level.

In Nigeria in particular, food has been the most significant contributor to price inflation over the last several years (Onitiri and Awosika, 1982). The study of price behaviour is therefore important for its contribution to our understanding of the phenomenon of rising cost of living.

In countries such as Nigeria where agriculture is predominant, the movement of agricultural prices can have ramifying effects on the economy. Findings of various studies point in this direction. In one of such studies, it was argued that the prices of foodcrops and the movement of such prices explain to a large extent, the skewness of a nation's income distribution especially as regards the rural sector (Ladipo and Adesimi, 1979). Olayemi (1976) buttressed this point by showing empirically how higher food prices paid by consumers are not being passed back to farmers in significant proportions. He opined that, "for some crops, in some parts of Nigeria, upward rising product

price movements would (soon) cease to be an incentive for increased production since expected net returns would not increase". Thus understanding the frequency and amplitude of food price flunctuation is very important in farm production decision-making. As Tisdell (1976) pointed out, establishing the price of farm products can affect sales and may actually raise the demand for such products while wide fluctuations in price can affect the incomes and profits of farmers in an adverse way.

According to Shepherd (1955), agricultural price movements are caused by different forces according to the length of time involved. Long-term movements are caused by changes in population, technology and real income. Short-run movements, on the other hand, are caused by changes in annual variations in weather, war, boom or depression and other unexpected and unpredictable factors. In his own study on rice marketing and prices in Kwara State of Nigeria, Olayemi (1973) identified three forms of price movements. These were rural-urban price differentials, inter-market price differentials and seasonal price movements. He noted that the weakest points in the marketing system concerned seasonal fluctuations and inter-market price disparities, deficiencies which can be linked with the problems of inadequate storage activity and poor market information respectively.

In view of the above, an attempt is made in this paper to examine the pattern of movement and the underlying cause of changes in food prices in Oyo State, the most populous state in southern Nigeria and an important centre of economic activities.

Materials and Methods

For the study, foodstuffs were examined for Osogbo, Oyo and Ibadan where continuous price data on selected food commodities were available from 1968 to 1981. The commodities selected for study were rice, maize and gari which form the basic staples of the majority of people in these areas. Moreover, they account for about 70 percent of total food traded in south-western Nigeria (Adeyokunnu, 1973).

Price data for the study were obtained essentially from the Oyo State Ministry of Finance and Economic Development (Statistics Division). The data collected were checked for consistency and, where necessary, updated with figures obtained from the Federal Office of Statistics and the Central Bank of Nigeria.

National Income data were extracted from the Second, Third and Fourth National Development Plan (Anon. 1970, 1975 & 1981).

Data on domestic food production were obtained from a number of publications including the Report of Agricultural Survey in the Western State of Nigeria, 1973, published by the Old Western State Ministry of Economic Planning and Reconstruction and the Report of the Rural Agricultural Sample Survey in the Oyo State of Nigeria, 1979, quoted in Awoyomi (1982). Provisional estimates of food production in Oyo State for the period 1979/80–1980/81 were obtained directly from the State Ministry of Agriculture and Natural Resources.

Indices and rates of change in commodity prices were determined. To estimate trend (annual) coefficients, price indices and percentage changes in price were calculated for the twelve months, January to December, for each year over the fourteen year period studied. To compute the indices, monthly price averages were first derived. The figures obtained were then detrended using a six-month centred moving average in an effort to remove, or at least reduce, the incidence of longterm fluctuations. The figures obtained were then expressed as percentages of the overall monthly average.

In order to examine the relationship between the various factors affecting food price increases, a regression analysis was carried out. The model for this analysis was arrived at in two steps. First, it was assumed that changes in price of a particular commodity during a period can be explained by past changes in own prices and present changes in the prices of close substitutes. Represented notationally, it means that determination of the current price of commodity R is influenced by the immediate past price of R and the current price of M, a close substitute. This can be translated into two simple equations thus:

$$P_{Rt} = f(P_{Rt-1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$P_{Rt} = f(P_{Rt-1}, P_{mt}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where P_{Rt} is the current price of R, P_{Rt-1} is the immediate past price of R and P_{mt} is the current price of M. To adjust for changes in the price level, all prices were deflated by the Consumer Price Index.

The second step involved the consideration of further variables which may affect the behaviour of price. Since it is not always possible to include all relevant explanatory variables those that were considered were the quantity and income variables. Both the quantity and income estimates were adjusted for changes in population. The population for each year for the period covered (1968–81) was estimated using the 1963 census figure and an annual growth rate of 2.53 percent

which was quoted for Nigeria by the Food and Agricultural Organisation of the United Nations (FAO, 1977) from the World Book Atlas.

Quantity estimates referred strictly to market availability of the commodities in question in the area of study. Income estimates were those based on the GDP figures quoted for Nigeria in the Second, Third and Fourth National Development Plans. Although it is realised that changes in price should have some influence on personal income, such an influence is assumed to be negligible. Thus income is assumed to be predetermined in this study.

The prices used in the study are retail market prices. The reason is that this would allow for the incorporation of most of the influences that have a bearing on the housewife's purchases in the market rather than limiting the case to farmgate prices. Moreover, there is discontinuity in the collection and availability of farmgate prices in Oyo State thus preventing rigorous analytical studies to be carried out at such a level.

On the basis of the foregoing discussions, a functional relationship was postulated between current prices (Y) for commodity R, commodity R prices in immediate previous periods (X_1), current quantity of commodity R (X_2) domestically produced in Oyo State, per capita income (X_3) and prices of close substitutes, Maize and Gari (X_4 and X_5) respectively. The following model was then arrived at:

$$Y = f(X_1, X_2, X_3, X_4, X_5, U) \quad \ldots\ldots\ldots (3)$$

where variables Y, X_1 to X_5 are as previously defined and U refers to the residuals.

As usual in regression analysis, it is assumed that the error components (1) are independent,

(2) have a mean of zero, and

(3) have the same variance throughout the range of Y values (Theil, 1961).

Each of the explanatory variables apart from (U) was also assumed to be non-stochastic. The postulated model also assumed that the degree of multicollinearity among the explanatory variables was not high (not statistically different from zero at 5%) in line with classical normal linear regression models assumptions (Johnston, 1963).

Specifically, the algebraic forms postulated were the linear:

$$Y = a_0 + a_1 X_1 + a_2 X_2 + a_3 X_3 + a_4 X_4 + a_5 X_5 + U \quad \ldots\ldots (4)$$

logarithmic:

$$\text{Log } Y = a_o + a_1 \log X_1 + a_2 \log X_2 + a_3 \log X_3 + a_4 \log X_4 + a_5 \log X_5 + U \quad \ldots\ldots\ldots\ldots (5)$$

where the variables are as previously defined.

The logarithmic function was fitted to the data to test for curvilinearity in the relationships.

Results and Discussion:

Trends in Price Indices

For the 14-year period covered (1968–81), retail prices of all the staple foods studied were found to have followed an upward trend. From a price index of 91 in 1968 to 301 in 1981 as shown in Table 1, rice sustained the highest price rise. This gives a movement of 210 points between the 1968 price index and the 1981 price index for Oyo State as a whole.

TABLE 1: MOVEMENT IN PRICE INDICES FOR RICE, MAIZE AND GARI IN OYO STATE 1968–1981

Year	Rice				Maize				Gari			
	Ibadan	Oyo	Osogbo	Average	Ibadan	Oyo	Osogbo	Average	Ibadan	Oyo	Osogbo	Average
1968	91	n.a	n.a	91	11	n.a	n.a	11	6	n.a	n.a	6
1969	103	n.a	n.a	103	21	n.a	n.a	21	16	n.a	n.a	16
1970	115	n.a	n.a	115	30	n.a	n.a	30	21	n.a	n.a	76
1971	127	106	107	113	40	448	45	44	36	43	45	41
1972	138	132	131	134	49	662	56	56	47	55	57	53
1973	162	184	179	175	69	88	78	78	67	79	81	76
1974	174	210	203	196	78	101	89	89	78	91	93	87
1975	186	236	227	216	88	115	99	101	88	103	104	98
1976	196	263	251	237	98	128	100	112	98	115	116	110
1977	210	289	276	258	107	141	121	123	109	127	128	121
1978	272	283	288	281	131	160	113	135	126	147	118	130
1979	380	500	393	168	225	116	170	170	133	125	108	122
1980	350	500	300	393	168	225	116	170	133	125	108	122
1981	329	287	301	225	178	158	187	172	162	162	150	161

Source: Publication of the Oyo State Min. of Finance and Econ. Deve. (Statistics Div.) Ibadan, Federal Office of Statistics, Lagos and the Central Bank of Nigeria, Lagos.

Between 1971 and 1981, the movement of rice prices was found to have been steadier at Osogbo than Ibadan and Oyo township (Table 1). Except in the last three years, rice prices were lowest at Ibadan. The reason for this may be found in the csomopolitan nature of Ibadan city and its ability to draw supplies from near and far away supply sources including Ofada to the South, Abakaliki to the East and Nguru to the North.

Between 1968 and 1981, maize price indices moved within 176 points in Oyo State. For the period 1971 and 1981, Osogbo recorded the lowest price movement (185 points). The trend values for Ibadan and Oyo increased from 10 and 48 to 225 and 178 respectively. It is important however, to note that Oyo town suffered a significant rise in maize prices in 1979 and 1980 as shown in Table 1, thus showing the vulnerability of Oyo township itself to rising prices.

Prices of gari generally rose in the state as a whole. A comparison of prices between Ibadan, Oyo and Osogbo, however, shows that Ibadan prices were the lowest between 1971 and 1981. In trend terms, price indices rose in Ibadan, Oyo and Osogbo by 114 points, 119 points and 127 points respectively. The monthly price indices obtained for the three commodities studied are shown in Table 2. At Ibadan, the highest index for rice (110) was recorded for the month of November. High level of price index points to the period of scarcity while a low level of price index indicates a period of boom or surplus coinciding with harvest when farm products are in abundant supply and their prices are depressed.

In Oyo town, the highest index for rice (108) was recorded in July as well, while the lowest index (91) was recorded in December. In Osogbo markets, the highest index (109) was recorded in June while the lowest index (82) was recorded in October. Thus, the seasonality of supply is not exactly the same for the three towns, as the highest and the lowest indices were not recorded in the same months. However, for the state as a whole, July was found to be the month of highest rice prices while October recorded lowest rice prices. This is understandable as rice harvest starts in October and as clearly demonstrated in the case of Ibadan markets, peak milling occurs in the month of November.

In Oyo State, the months of February/March and May/June are months of relatively high prices for maize. Price indices of 100, 105, 107 and 110 were recorded for those months respectively. The highest index of 110 was recorded for June in the immediate pre-harvest period. Maize prices were low between September and December which

coincides with the harvest period of the main crop for the year. By October, most of the maize had entered the distribution system. With an index of 93, October recorded the second lowest set of prices for maize in the year. In December, harvesting of late maize added to existing supplies to depress prices further and thus accounting for the all year low price index of 90.

TABLE 2: SEASONALITY INDICES FOR RICE, MAIZE AND GARI IN OYO STATE, NIGERIA.

	Rice				Maize				Gari			
Month	Ibadan	Oyo	Osogbo	Average	Ibadan	Oyo	Osogbo	Average	Ibadan	Oyo	Osogbo	Average
January	103	100	101	101	101	100	91	97	110	100	111	107
February	105	91	107	101	102	97	100	100	**120	128	**125	**115
March	107	96	106	103	101	**106	109	105	102	**114	111	109
April	106	92	100	99	111	108	*85	98	107	111	101	106
May	106	106	105	106	111	103	107	108	110	110	109	109
June	107	105	**109	107	**112	103	**114	**110	105	106	100	104
July	**110	**108	108	**109	104	103	105	106	101	89	95	95
August	108	107	97	104	97	100	105	101	93	85	86	*88
September	94	100	*82	*90	93	*96	100	98	91	94	*85	90
October	87	100	*82	*90	93	*96	90	93	*89	*85	86	87
November	*83	105	96	94	92	98	101	97	*89	97	88	91
December	84	*89	97	91	*90	88	93	*90	94	101	101	99

Note: Double asterisks indicate months of highest prices.
Single asterisks indicate months of lowest prices.

The trend in monthly indices for gari reveals that February is a month of high gari prices, during which the highest index for the state as a whole (115) was recorded. An index of 88 was recorded in August. The last six months of the year (July to December) were generally months of relatively low gari prices.

Low price indices of 86, 85, 86 and 88 were calculated for gari in Osogbo town for August, September, October and November respectively. In Oyo town, low indices of 89, 85, and 95 were calculated for July, August and October while for Ibadan, a low price index of 89 was calculated for October and November. It is generally presumed that cassava (from which gari is made) can be harvested at any time of the year though the month or months during which it is actually harvested would vary from place to place and from farmer to farmer.

Generally, it appears that the timing of high and low points of seasonal price indices tends to be consistent with the timing of harvest; prices are at their maximum at the immediate preharvest period and reach their lowest at the immediate post-harvest period.

On an annual basis, the quantities of cereals found seem to have been outpaced by the demand for these foodstuffs. For example, the rate of increase in rice prices was high, amounting to an average of 15% increase between 1968 and 1981. For maize, an average of 12.6% increase was recorded during the same period. The tendency for rising cereal prices can be attributed to inflation and the failure of supplies to keep pace with rapidly increasing demand for food. As Olayemi (1976) succintly put it, "the wide diversity in the rates of increase in the prices of various food commodities and among various areas is indicative of a basic imbalance in the composition of food supply relative to the composition of food demand". This is compounded, as it were, by the dearth of storage facilities, lack of adequate feeder roads and inadequate supply of vehicles in the rural areas. Adejumobi (1970) also argued that improved communications and adequate storage facilities would reduce the fluctuations in food prices in different markets. She opined that an adequate communication system would effect simultaneous price changes in consuming districts, and that the existence of unduly high prices in one market would induce a diversion of food supply to the other markets so that prices would rise in the other markets.

Estimated relationships between factors affecting food prices.

A total of 10 regression equations were obtained using the stepwise-variable inclusion regression procedure (SPSS), as shown in Tables 3 and 4. The regression coefficients obtained were tested using a one-tailed t test, since a priori information indicates the direction of the effect of each predetermined variable upon the dependent variable (Pasour, 1965). Equations 4 and 9 were chosen as the lead equations.

TABLE 3: STEP–WISE REGRESSION RESULTS FOR RICE PRICE INCREASE, (1968–81) LINEAR FUNCTION.

Step/ Equation Number	Intercept	Independent variables X_1	X_3	X_4	X_5	X_2	R^2	$\bar{R}^2$	F value
1	0.01587	0.93069** (0.14697)					0.76583	0.74632	39.24504
2	0.11943	0.86967** (0.14912)	0.00171 (0.00135)				0.79533	0.75812	21.37283
3	0.6370	0.83814** (0.15310)	0.00207 (0.001411)	0.36936 (0.38563)			0.81253	0.75629	14.44734
4	0.05516	0.85394** (0.16794)	0.00214 (0.00150)	0.46589 (0.51262)	−0.09317 (0.30408)		0.84447	0.73201	9.87715
5	0.06173	0.86314** (0.19306)	0.00226 (0.00187)	0.47230 (0.54570)	−0.08909 (0.32392)	0.00001 (0.00001)	0.81482	0.69908	7.0405

Notes: Standard Errors are in parenthesis.

*Significant at 10% level:
**Significant at 5% level;

Step 4 is the relevant equation.

TABLE 4: STEP-WISE REGRESSION RESULTS FOR RICE PRICE INCREASE (1968–81) LOGARITHMIC FUNCTIONS

Step/ Equation Number	Intercept	X_1	X_3	X_4	X_5	X_2	R^2	$\bar{R}^2$	F_{value}
6	−0.08328	0.95893** (0.15919)					0.75148	0.73077	36.28578
7	0.28281	0.87318** (0.16810)	0.21296* (0.08657)				0.78479	0.74366	20.05655
8	0.39318	0.86305* (0.67592)	0.09048) (0.09048)	0.06785 (0.14903)			0.78916	0.72591	12.47659
9	0.49014	0.88569** (0.18277)	0.12625* (0.09335)	0.23167 (0.27068)	−0.11744 (0.16027)		0.80103	0.71260	9.05837
10	0.72993	(0.89909)** (0.20615)	0.13664 (0.11323)	0.22611 (0.17106)	−0.11329 (0.10606)	−0.2005 (0.10606)	0.80191	0.67810	6.47703

Note: Standard Errors are included in parenthesis
Step 9 is the relevant equation

*Significant at 10% level;

**Significant at 5% level;

They suggest that there is a positive and significant ($p \leq 0.05$) relationship between current rice prices and the immediate past prices of rice. A significant and positive relationship ($p \leq 0.1$) was also shown between current rice prices and per caput income.

The coefficients of the prices of competing commodities (maize and gari), however, turned out not to be significant at an acceptable level. In fact, contrary to a priori expectation, the coefficient of maize price was positive. This is probably because maize is not a substitute for rice in the area of study. The coefficient for gari was negative in accordance with traditional demand theory, implying that consumers would shift from rice to gari when the price of the former is too high.

The quantity coefficient in equation 5 is negative. This is to be expected as domestic production of rice in the area of study was not appreciable and, perhaps, might just have been decreasing over time. For the country as a whole, the shortfall in food availability had been met by resorting to food importation particularly with respect to rice in the past. In the five year period, 1974–75–1978–79, the value of total food imported ammounted to ₦3, 780.1 million. The amount spent on food importation in 1979 alone was ₦1,105.9 million out of which the sum of ₦212.7 million was spent on rice importation. Fajana (1977) has rightly described such a rate of growth of food importation as 'phenomenal' and the country's food import bills as 'very high'. The need to improve the quantity of food locally produced is therefore seen to be important. Unfortunately however, the influence of importation on domestic prices in Oyo State per se could not be tested as available data (Table 5) relate to the country as a whole and the proportion that went to Oyo State in each year could not be ascertained. It is hoped that future research efforts would shed more light on this aspect.

The variables considered in Tables 3 and 4 together explained between 68 percent and 76 percent of the variability in the current prices of rice. A closer examination of the values of R^2 reveals that the single most important determinant of price movements seems to be last season's (immediate past) prices, which satisifed a priori expectation. As would be expected also, the proxy for money supply (ie current income) improved the goodness of fit in both Tables 3 and 4. This has implications for inflationary trends. But more important is the non-significance of quantity coefficients. The inclusion of that variable actually resulted in a decrease in the value of R^2 in both tables. This has implications for market supply and calls for in-depth studies (such as those by Keita, 1979; Ngambeki 1980 and Oludimu, 1983) on

peasant farmers' behavioural response to food prices. Such an insight is needed particularly because of the severe problems peasant agriculture continues to face in keeping food supplies (especially rice production) in pace with domestic demand.

TABLE 5: DOMESTIC RICE PRODUCTION, RICE IMPORTATION AND RICE IMPORT BILL IN NIGERIA (1968–81)

Year	Domestic Rice Production (in '000 tonnes of milled rice)	Net Rice Import (in '000 tonnes)	Total Rice Supply (in '000 tonnes)	Rice import Bill (₦ million)
1968	151.8	0.310	152.110	0.050
1969	230.4	0.641	231.041	0.180
1970	345.0	1.722	346.722	0.140
1971	383.0	0.300	383.300	0.050
1972	447.0	5.900	452.900	0.990
1973	487.0	1.100	488.100	0.270
1974	525.0	4.000	529.000	1.500
1975	515.0	6.700	521.700	2.380
1976	534.0	45.000	579.000	20.140
1977	667.0	413.00	1,080.000	154.940
1978	695.0	770.00	1,405.000	194.760
1979	850.0	700.00	1,550.000	212.900
1980	612.0	70.300	680.300	n.a
1981	720.0	105.700	825.700	n.a

Source: Federal Office Statistics and Central Bank of Nigeria. N.a. means 'not available'

Summary and Conclusions

The study of price behaviour is important not only in enhancing our understanding of market supply behavioural patterns but also for its contribution to our understanding of the phenomenon of rapidly increasing cost of living. In this study, an attempt has been made to examine the variation in food prices over time in one of Nigeria's nineteen states. The study concentrated on three commodities namely, rice, maize and gari which account for about 70 percent of the total food traded and consumed in Oyo State, the chosen area of study.

First, trend coefficients and seasonality indices were calculated and used in appraising the temporal movement in prices in Ibadan, Oyo and Osogbo retail markets. It was found that, generally, the timing of high and low points in seasonal price indices tended to be

consistent. In terms of variations in prices, rice was found to have sustained the greatest percentage increase between 1968 and 1981.

A quantitative assessment of the causes of the huge increases in rice prices, was then undertaken through regression analysis. The results of the regression analysis indicate that last season's (immediate past) prices and the quantity of money supply (evidenced in per capita current income) have a major influence on the current level of prices especially for rice.

In view of the consistently rising prices of food, it is recommended that efforts should be intensified to increase local production of foodstuffs (especially rice) while re-organising the market structure for staples. There is the need to create greater awareness of the food situation in the country in traders and farmers alike, and to mobilise all concerned in arresting the undesirable inflation in prices. Active and committed farming cooperatives and production groups should be established to assure the country of increased production of staples. Marketing cooperatives should also be motivated to handle food commodities efficiently as a necessary step towards guaranteeing reasonable food prices.

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