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AN ANALYSIS OF FOOD PRICES IN INDIA. (DURING 1948-1957)

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INTRODUCTION

The object of this study is to find out the broad trends and fluctuations in wholesale prices of foodgrains, during the decade 1948-1957. Four principal foodgrains, *viz.*, rice, wheat, jowar and bajri which together comprise 18 per cent of the total weights in General Index were selected for the study. Their comparative movements as well as their movements in relation to General Price Index were studied. The analysis is done mostly, on the basis of the monthly wholesale price index published by the Government of India with August 1939 as base. This index was selected because the index with 1952-53 as base was not available for a part of the period under review. The remoteness of the base year from the period under study is not a great limitation as the purpose is to compare the movements between the selected commodities.

GENERAL RELATIONSHIP

A careful examination of the movements of price indices for individual commodity suggested certain important relationships. It was observed that the movements of all the four commodities and the movement of General Index were in the same direction. However, there was a greater affinity in the movements of some series.

The affinities in the movements could be discerned by the simple measure of coefficient of correlation. In one case, however, more refined method of x^2-chi-square test was applied to test the goodness of fit.

It was observed that there was a close affinity between rice prices and the General Index during this period. The coefficient of correlation was highly significant (.877). The same was not true about the relationship between the General Index and wheat inasmuch as the coefficient of correlation was .095. It should be noted that since 1950 wheat was the only foodgrain the supply and market release of which could be considerably influenced by the Government because of sizable import programme. This was not true in case of rice, and the other major foodgrains.

Wheat seems to be important for another reason. The price of wheat had a close affinity with prices of two minor cereals, *viz.*, jowar and bajri. Over a large part of wheat consuming area these are close substitutes. As expected, a high coefficient of correlation (.685) existed between wheat and bajri. The affinity between wheat and jowar was not brought out so clearly by the measure of coefficient of correlation. On a closer scrutiny it was found that the yearly figures which were used for measuring the coefficient of correlation did not bring out

the relationship properly, possibly because of a lagged relationship at monthly level.[1]

TRENDS IN PRICES

In order to discern the trends in the prices of various commodities the data were processed separately for two periods, *viz.*, (1) from January 1948 to March 1951 and (2) from April 1951 to June 1957. The first period is the pre-Plan period, while the later seven years represent the Plan period.

Looking to the wide scatter of the points, a straight line fitted by the method of least square would have allowed very rough approximation to the actual trend. Therefore, a curve of third degree (byorthogonal polynomials) was fitted to the monthly price indices of all the four commodities as well as to the General Index to process the data more realistically.[2]

Price Trends during 1948-1951

During this period the General Index, rice and jowar prices showed a generally upward sloping trend throughout the period. However, in case of jowar upward movement was halted during last 6-7 months. The curvatures of the trends, however, differed at various points. The trend in wheat prices suggested an upward inclination during first 10 months, a downward inclination for next 20 months and again an upward movement in the last 10 months. Only in the case of bajri prices the movement was clearly downward, throughout the period.

For an overall view the best fit for the commodities was made by selecting 9 points on each trend line. From these points a regression line was derived by the method of least squares. Inclination and value of these lines are given in Table I.

TABLE I—INCLINATION AND VALUE OF TREND LINES (JAN. 1948—MARCH 1951)

	Angle	Value	Remark
General Index	30°	.5774	Upward
Rice	30°	.5774	Upward
Wheat	10°	.1763	Downward
Jowar	41°	.8693	Upward
Bajri	30°	.5774	Downward

It is clear from the above table that the General Index, rice prices and jowar prices had an overall upward inclination during this period, while wheat prices had a slightly downward trend and bajri a markedly downward trend.

1. An application of chi-square test, however suggested that our hypothesis, based on visual observations of the plotted points on graph-paper, was not disproved.

2. Though an analysis of residual variances as well as 'Fisher's test' suggested that a higher fit, *i.e.*, 'fourth or fifth degree,' would have given still better results. Yet in view of the paucity of resources and time it was decided to work upto third degree curve.

It was also observed that incipient trend in jowar prices was most steep, followed by that in rice prices and General Index. Between the two commodities prices of which showed downward inclination, namely wheat and bajri, the incipient downward trend in prices of bajri was more marked.

Price Trends during 1951-57

During this period prices of all the commodities, excepting jowar but including General Index, showed similar movements, rising gently during first 20 months or so, declining, also gently, for next 25 to 30 months when they had gone below the original position in rice, wheat and General Index and then rising rather steeply during remaining 30 to 35 months, when again the prices of three commodities, *viz.*, rice, wheat and bajri as well as General Index passed the highest peaks reached during the preceding upward phase. The jowar prices suggested a 'U' shape curve over the period.

The overall view is gained by fitting the regression line. Due to greater length of the period, 16 readings from the trend lines (1, 5, 10 .....75) were taken. The values arrived at are shown in Table II.

TABLE II—INCLINATION AND VALUE OF TREND LINES (APRIL 1951—JUNE 1957)

	Angle	Value	Remark
General Index	1°	.0175	Upward
Rice	10°	.1763	Upward
Wheat	3°	.0349	Upward
Jowar	1°	.0175	Upward
Bajri	20°	.3640	Upward

The overall trends during this period in the prices of all the four commodities differed. The trend was a subdued one in the case of wheat and jowar, in the case of rice prices and still more perceptibly in bajri prices, the inclination was markedly steep.

As the original trend lines had suggested a downward as well as upward movements, it was decided to measure separately the inclinations when the trends were in different phases. This was done to get an idea about the incipient momentum with which the prices moved in the upward and in the downward phase during this period.

For this purpose a simple method of drawing tangent at the lower and upper segments of the trend curve was adopted. This is undoubtedly an approximate method, but it would serve the purpose alright.

The measures of inclinations arrived by drawing the tangents and measuring the angles that they make during upward and downward phases are given in Table III.

TABLE III—ANGLES AND VALUES OF TREND LINES DURING UPWARD AND DOWNWARD MOVEMENTS (APRIL 1951—JUNE 1957)

	Downward Movement		Upward Movement	
	Angle	Value	Angle	Value
General Index	34°	.6745	31° 57°	.6009 1.5399
Rice	21°	.3839	32° 60°	1.6249 1.7321
Wheat	40°	.8391	50° 66°	1.1918 2.2460
Jowar	47°	1.0724	66°	2.2460
Bajri	24°	.4452	35° 65°	.7002 2.1445

Excepting jowar prices, the prices in all the commodities witnessed two upward phases during the period, the trend in the second upward phase was invariably steeper. As a rule, it was found that downward inclination of the prices was less steep than the upward inclination—only exception being the first upward phase of the General Index. Similarly it was found that movements in prices of different commodities were moving with different inclinations during downward phase varying with a 21° inclination in rice prices to 47° inclination in jowar prices. However, during upward phase, the movements in prices were very much similar in all the commodities.

An overall impression was gained that during 1948-1951, the food prices were rising, as in case of rice and jowar ; or falling, as in case of bajri, along the trend having one discernible direction, the only exception being wheat prices which had shown an upward, downward, and again an upward trend within the period. The type of zig-zag trend witnessed in the case of wheat prices alone in this period was observed in regard to the prices of practically all the selected commodities during the second period, *viz.*, 1951-57.

A possible explanation of this phenomenon might be the presence of a cycle in the food prices which could fully reveal itself in the later period, which was also a longer period, *viz.*, 7 years. However, because of the short period under review, and further its division in pre-Plan and Plan periods, it was not found possible to measure accurately the duration of cycles in food prices, though as noted above, there were some rough indications of cyclical behaviour in the prices of the commodities under review.

DEVIATIONS FROM TRENDS

It was observed, however, that there were marked oscillations of prices around the regression line suggesting some sort of seasonal pattern in prices. We have

made a slight change in division of periods. The two periods selected for following analysis were January 1948 to December 1950 and April 1951 to March 1957.

Table IV brings out the deviations from the trends in the case of the selected commodities. In the case of rice prices, it was observed that prices moved below

TABLE IV—DEVIATIONS OF MONTHLY PRICES FROM THE TREND DURING JANUARY 1948 TO DECEMBER 1950 AND APRIL 1951 TO MARCH 1957

Month	Rice		Wheat		Jowar		Bajri	
	1948 to 1950	1951 to 1957	1948 to 1950	1951 to 1957	1948 to 1950	1951 to 1957	1948 to 1950	1951 to 1957
January ..	—10.69	—31.31	+11.16	+27.47	— 3.01	— 5.01	—26.61	+ 4.77
February ..	—16.16	—21.99	+30.79	+24.99	+ 5.86	— 2.76	—10.10	— 0.14
March ..	—13.84	—18.79	—23.04	+18.02	+ 2.06	—10.07	— 6.07	— 3.51
April ..	— 5.33	+ 0.32	—47.54	— 3.04	+ 5.17	— 2.22	— 9.69	— 1.15
May ..	— 6.33	+ 3.00	—38.44	—33.34	+10.71	— 2.98	+ 2.25	— 7.16
June ..	+ 2.86	+ 6.53	—39.63	—24.08	+23.21	+ 4.63	+11.39	+ 0.84
July ..	+12.52	+11.77	— 8.58	— 4.46	+30.38	+17.01	+15.76	+ 5.23
August ..	+15.92	+22.37	— 1.72	— 1.83	+23.63	+14.13	+11.38	+14.98
September ..	+14.34	+30.06	+ 1.51	— 6.88	+16.00	+ 2.61	+10.61	+ 7.13
October ..	+11.05	+11.11	+11.99	— 0.47	+21.88	— 0.63	+11.80	+ 4.26
November ..	+ 9.99	— 1.64	+39.28	+ 9.88	+51.99	+ 2.47	+ 3.31	+ 8.74
December ..	— 1.57	—17.12	+57.93	+17.83	+11.38	— 1.84	+ 0.18	+ 3.71

the trend from December to May, for a duration of 6 months, in first period. In the second period they moved below the trend for 5 months from November to March. In the case of wheat, prices moved below the trend from March to August for a period of 6 months, in the first period. During second period prices were below the trend from April to October, *viz.*, for 7 months. The prices of jowar during 1948-50 showed actual decline from trend for only one month, *viz.*, in January, though for following three months prices moved more or less along the trend line. During the second period prices showed a clear seasonal pattern, keeping below the trend from December to May. There was also a slight decline in October. In case of bajri, prices were below the trend from January to April in first period and from February to May during second period.

Table V gives mean seasonal fluctuations from year to year during 1948-50 and during 1951-57. It was found by application of the method of analysis of variance assuming that no significant changes in the mean variations have occurred among different commodities over both the periods.

TABLE V—MEAN SEASONAL VARIATIONS FROM YEAR TO YEAR (1948 TO 1957)

Year	Wheat	Rice	Jowar	Bajri
1948	+ 1.82	+ 3.32	+ 6.22	+ 9.31
1949	— 9.62	— 2.33	+18.70	— 4.66
1950	+24.25	+ 2.85	+22.97	— 7.67
1951—1952	— 0.36	+26.75	+ 2.16	+12.68
1952—1953	— 9.58	—16.63	—21.08	—19.01
1953—1954	+43.81	+ 1.25	+29.78	+36.00
1954—1955	—14.29	—19.35	+ 2.59	— 5.79
1955—1956	—24.63	—23.56	—34.59	— 6.65
1956—1957	+17.10	+32.17	+28.98	+ 1.39

Table VI gives the magnitude of seasonal variations in prices of different commodities measured by the method of coefficient of standard deviations.

TABLE VI—YEAR TO YEAR OSCILLATIONS IN THE PRICES—COEFFICIENT OF STANDARD DEVIATIONS $= \frac{6}{\alpha}$ (1948-1957)

Year	Rice	Wheat	Jowar	Bajri
1948	+ 4.78	+44.97	+ 3.05	+ 3.93
1949	— 4.27	— 6.75	+ 1.51	— 1.51
1950	+ 5.40	+ 0.84	+ 1.73	— 0.87
1951-52	+ 0.87	—86.94	+ 9.07	+ 1.66
1952-53	— 1.03	— 2.54	— 0.65	— 0.45
1953-54	+15.22	+ 0.63	+ 0.47	+ 0.66
1954-55	— 1.91	— 2.64	+11.22	— 2.26
1955-56	— 1.33	— 2.36	— 0.77	— 2.75
1956-57	+ 0.66	+ 0.87	+ 1.15	+18.37

In the case of rice prices, coefficient of standard deviations was low in the second period compared to first period, the only exception being the year 1953-54. In the case of wheat prices, the deviations were highest in the initial years of the two periods, *viz.*, 1948 and 1951-52, which might be due to the not very accurate fit of the trend curve in these years. If these two years are omitted the coefficient

of standard variations is smaller in the second period. In jowar no clear pattern was discernible. Out of the six years in the second period, in two years, 1951-52 and in 1954-55, the coefficient of deviations were higher than any figure in the first period. For the remaining four years they were low. In the case of bajri, the deviations were very small excepting in the last year under review, *viz.*, 1956-57.

Again, if some of the abnormal years are taken out, the magnitude of coefficient of standard deviations between commodity prices and between years do not show any significant variation.

RANDOM VARIATIONS

Table VII gives the mean random variations for the prices of all the selected commodities.

TABLE VII—MEAN RANDOM VARIATIONS IN THE PRICES—(1945-1957)

Year	Rice	Wheat	Jowar	Bajri
1948	+ 2.26	+ 2.33	— 3.35	+ 8.12
1949	— 3.31	— 9.10	+ 2.96	— 6.38
1950	+ 1.79	+24.81	+ 5.64	— 8.86
1951-52	+27.24	— 2.37	+ 0.88	+ 9.54
1952-53	—16.16	—11.59	—22.36	—22.16
1953-54	+ 2.45	+41.81	+28.49	+32.85
1954-55	—23.04	—16.30	+ 1.31	— 8.94
1955-56	—23.69	—26.97	—35.88	— 9.80
1956-57	+33.18	+12.88	+27·70	— 1.50

It was observed that the random variations in prices in practically every commodity were not significantly different during the first period, the only exception being the prices of wheat. While in the later period, they were significantly different. It was also observed that as a rule variations were larger in second period than in the first.

An analysis of variances corroborated the conclusion, *viz.*, there was no significant variations in the first period and that there were significant variations during the second period.

CONCLUSIONS

Following conclusions emerge from the above study of the prices of the four important foodgrains.

(1) There is a close relationship between the prices of rice and the General Index of prices.

(2) There is a close relationship between the prices of wheat and the prices of two minor cereals, namely, jowar and bajri.

(3) The first three pre-Plan years were characterised by high foodgrain prices.

(4) The first seven Plan years were characterised by the continuation of the same price trends, with the exception of rice and bajri, without making the price increases steeper than they were during the first three pre-Plan years. In the case of rice and bajri, the prices gained further momentum in upward direction.

(5) Prices of cereals declined with less momentum compared to the momentum they gathered in rising phase.

(6) The oscillations of the prices of foodgrain around the trend in the first Plan years were sharper and were of longer durations compared to three earlier years.

(7) There was no significant change in the pattern or the magnitude of seasonal deviation during the years under review.

(8) There were significantly large random variations during the first seven Plan years compared to three earlier years.