

INDIAN FOREIGN TRADE (1933—37) : ITS RELATION TO EXCHANGE RATE

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INTRODUCTION.

Prof. J. C. and Dr. H. Sinha have discussed the course of the depression in India in a paper on "India through the Depression" recently.* In that paper they have covered the period April, 1929 to January, 1933, which they divided into the following sub-periods:—(I) April to September, 1929 (Strain preceding depression); (II) October, 1929 to June, 1930 (First phase of the depression during which the incidence on agriculture was specially acute); (III) July, 1930 to August, 1931 (Second phase of the depression during which all items of economic life were affected); (IV) September, 1931 to December, 1932 (Third phase of the depression during which the rate of deterioration of economic position gradually slackened); and (V) January, 1933 (The beginning of recovery).

The general opinion among economists and businessmen is that revival started from the beginning of 1933. In this article, therefore, the period chosen for consideration is from January, 1933 to March, 1937.

DATA AVAILABLE AND THEIR REDUCTION.

Data relating to export and import are taken from the monthly *Accounts relating to the Sea-borne Trade and Navigation of British India* and reproduced in Columns (2) and (3) of Table 1. In each case net figures are recorded. In other words, we consider exports of Indian merchandise and imports exclusive of re-exports. Unfortunately, only value figures are available. Quanta figures for fiscal years alone are published in the annual *Review of the Trade of India*. The value figures are affected by variation in the general price level. For this reason these monthly figures for export and import have been divided by the respective "Index Numbers for Declared Values" available in the *Monthly Survey of Business Conditions in India* and shown in columns (4) and (5) of Table 1.

SEASONAL VARIATION.

Our problem now is to find whether exports rose relatively to imports or imports relatively to exports. But as we are working with monthly data, it is necessary in the first instance to adjust the two series by allowing for variation due to what is technically known as "Seasonal Variation".

A number of methods are available for this purpose. Person's 'Link Relative' method has been followed here in preference to others, for, in all other methods, the trend is computed before the seasonal index is determined. Our problem, however, is to determine the trend as accurately as possible. Thus Person's method, seems to be the appro-

* Read at the First Session of the Indian Statistical Conference, Calcutta, 1938. To be published in the Proceedings of the Conference and in *Sankhyā*, Vol. 4, Part 2 (*In Press*).

TABLE 1. MONTHLY DATA RELATING TO EXPORT AND IMPORT, JANUARY, 1933—MARCH, 1937.*

Year (1)	Exports of Indian Merch- andise (2)	Net Imports (exclu- sive of re- exports) (3)	Index Number for Declared values		Derived Quanta figures for		Quanta figures adjusted for seasonal varia- tion		Calculated Figures for		Normal Values of		Percentage Deviations of Normal from Observed Figures for	
			Export (4)	Import (5)	Export (6)	Import (7)	Export (8)	Import (9)	Export (10)	Import (11)	Export (12)	Import (13)	Export (14)	Import (15)
1933	11.4	10.4	72	80	15.6	13.0	15.1	11.6	15.64	12.12	16.5	13.5	...	...
January	12.2	9.0	70	81	17.4	11.1	15.0	11.8	13.75	12.16	17.2	13.4	...	...
February	12.2	9.2	69	82	17.4	11.2	14.9	11.7	13.75	12.16	17.2	13.4	...	...
March	12.2	9.2	67	77	15.2	12.3	14.6	11.7	15.97	12.26	16.6	12.8	...	...
April	10.6	9.5	68	78	15.6	12.2	14.8	11.9	16.08	12.30	17.0	12.6	...	...
May	12.7	8.4	71	75	17.0	11.2	18.4	12.1	16.20	12.64	15.8	11.5	...	...
June	12.7	8.4	70	79	15.8	11.6	16.0	12.0	16.31	12.67	15.6	11.5	...	...
July	14.0	9.6	80	80	11.5	12.0	20.8	12.0	16.42	12.44	13.8	12.4	...	...
August	11.8	8.4	77	82	14.7	10.2	17.6	11.3	16.54	12.48	13.8	11.9	...	...
September	12.6	10.3	72	70	17.5	13.0	17.9	12.4	16.65	12.53	16.3	13.1	...	...
October	12.0	9.7	67	78	19.8	12.4	19.0	11.8	16.77	12.57	17.0	13.2	...	...
November	11.6	8.9	66	70	17.6	11.5	17.7	12.2	16.89	12.62	16.8	11.7	...	...
December	11.4	10.4	69	83	16.5	12.5	15.8	11.2	17.01	12.67	17.8	14.1	...	...
1934	12.3	8.5	69	76	18.1	11.2	16.6	11.0	17.12	12.72	18.6	11.9	...	...
January	12.3	8.5	69	80	20.7	12.0	17.0	12.1	17.25	12.77	21.0	13.6	...	...
February	12.3	8.5	69	83	19.1	12.9	18.4	12.3	17.37	12.80	18.6	13.6	...	...
March	12.3	8.5	67	77	15.8	13.4	18.8	13.1	17.40	12.85	18.5	13.1	...	...
April	13.1	10.8	65	71	17.1	13.2	17.5	14.2	17.61	12.90	17.2	12.9	...	...
May	12.8	9.4	72	71	17.1	13.2	17.5	14.2	17.61	12.90	17.2	12.9	...	...
June	12.6	9.6	74	74	17.0	13.0	18.8	13.6	17.73	13.03	18.1	13.4	...	...
July	12.6	9.6	76	76	15.0	13.8	18.0	13.8	17.86	13.00	15.0	13.0	...	...
August	12.1	10.5	76	76	15.0	13.8	18.0	13.8	17.86	13.00	15.0	13.0	...	...
September	11.0	10.8	75	81	15.0	12.7	19.0	14.0	17.98	13.03	15.1	11.9	...	...
October	12.1	12.2	72	74	16.6	16.5	17.1	15.8	18.11	13.00	17.7	13.7	...	...
November	12.0	11.1	70	77	17.1	14.4	16.8	13.7	18.23	13.14	18.5	13.8	...	...
December	11.7	9.7	67	73	17.5	13.8	17.6	14.4	18.37	13.19	19.3	12.2	...	...

*NOTES—
Col. (1) and (2)—in error of rupees
Col. (3) and (4)—Base 1933-34=100
Col. (6) = Col. (2) x 100 / Col. (4)
Col. (7) = " (3) x 100 / " (5)
Col. (8) = " (6) / Seasonal indices
Col. (9) = Col. (7) / Seasonal indices
Col. (10) = Equation " (8) x " (11) = " (12)

INDIAN FOREIGN TRADE (1933-37)

TABLE 1 (Continued). MONTHLY DATA RELATING TO EXPORT AND IMPORT, JANUARY, 1933-MARCH, 1937.*

Year	Exports of India merchandise		Net imports (excluding exports)		Index Number for Prices		Derived quanta figures for		Quanta figures adjusted for seasonal variation		Calculated figures for		Normal values of		Percentage Deviation of Normal from Observed figures for	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
1933																
January	124	57	200	157	182	152	182	182	182	182	182	182	182	56	79	112
February	152	62	74	167	137	172	148	172	148	160	150	150	150	...	...	...
March	108	72	83	211	148	178	184	1975	1824	2709	142	142	142	...	...	...
April	108	70	79	184	148	148	187	1888	1930	196	140	140	140	...	...	...
May	180	116	77	214	181	208	188	1922	1844	201	137	137	137	63	50	102
June	325	95	70	176	122	181	181	1015	1840	147	125	125	125	...	...	...
July	118	85	78	181	186	167	142	1929	1954	175	120	120	120	...	...	...
August	118	109	77	188	145	182	145	1942	1958	164	136	136	136	...	...	...
September	118	100	78	181	182	180	186	1055	1963	164	123	123	123	...	...	...
October	142	115	74	192	185	196	148	1909	1969	109	143	143	143	...	...	...
November	142	128	71	200	168	197	160	1983	1974	201	144	144	144	...	...	...
December	184	108	69	76	194	186	147	1997	1970	199	128	128	128	...	...	...
1936																
January	140	187	60	72	208	100	194	170	2010	1364	210	154	154	...	...	...
February	151	102	71	73	218	140	196	140	2025	1380	211	180	180	...	...	...
March	160	105	60	79	232	138	198	185	2030	1504	219	148	148	...	...	...
April	150	98	71	68	211	142	208	186	2053	1870	218	146	146	...	...	...
May	142	98	72	72	197	186	167	188	2067	1403	218	144	144	...	...	...
June	132	95	72	73	183	180	188	140	2082	1400	209	131	131	...	...	...
July	141	88	74	72	191	186	211	142	2097	1415	190	135	135	...	...	...
August	139	90	70	77	176	117	209	117	2112	1820	189	142	142	...	...	...
September	146	90	78	71	185	127	221	140	2126	1424	178	129	129	...	...	...
October	161	102	74	75	218	186	222	181	2141	1481	210	150	150	...	...	...
November	180	111	72	72	237	189	238	182	2156	1486	211	151	151	...	...	...
December	178	94	70	77	237	182	239	182	2171	1441	216	153	153	...	...	...
1937																
January	207	112	75	75	284	149	272	184	2180	1446	278	161	161	...	...	...
February	215	126	74	76	295	162	242	182	2212	1437	270	155	155	...	...	...
March	215	126	75	78	295	162	242	182	2212	1437	270	155	155	...	...	...

*Croses—Cols. (2) and (3)—in croses of rupees
 Cols. (4) and (5)—Base 1918-14=100
 Cols. (6) and (7)—Seasonal indices
 Cols. (8) and (9)—(3) × 100 / Col. (3)
 Cols. (10) and (11)—(5) × 100 / Col. (5)
 Cols. (12) and (13)—(6) / Seasonal indices
 Cols. (14) and (15)—(10) = Equation 13
 Cols. (16) and (17)—(11) = "

private one. The actual link relatives and their computation are given in Tables 2A and 2B, the first for exports and the second for imports.

It is usually desirable that the seasonal index should be found from data for at least 8 to 10 years. At the same time it is important that the period used for this purpose should be as free as possible from economic disturbances. It is for this reason that the computation of the index on a narrow basis is often resorted to. To give only one example, in the case of the *Economist* Index of Business Activity, figures for less than five years were taken into consideration.¹ In the present case, we have chosen a period roughly covering the upward phase of a trade cycle. Technically, therefore, it cannot be called a normal period, but it is nevertheless true that there was no major economic disturbance during the period in question.

SECULAR TREND.

The quanta figures for exports and imports inserted in columns (6) and (7) in Table 1 have been adjusted by these seasonal indices, the results being shown in columns (8) and (9).

TABLE 2A. SEASONAL INDICES OF DERIVED EXPORT QUANTA FIGURES.

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
1933	92.9	110.1	102.3	83.4	102.6	114.7	85.5	114.4	84.0	119.0	110.3	91.2	...
1934	93.8	109.7	114.4	92.8	103.7	86.1	99.4	93.5	100.0	105.7	101.8	102.3	...
1935	114.3	88.5	112.8	73.0	139.0	82.2	85.8	101.9	98.7	127.2	104.2	97.0	...
1936	104.6	104.9	108.9	90.9	93.4	92.9	104.4	92.1	105.1	117.8	108.7	100.0	...
1937	119.8	80.5	114.8	74.9	91.0	105.0	98.4	85.3	113.1	96.8	101.1	...	...
Mediana ...	104.6	104.9	112.8	83.4	102.6	92.9	93.4	93.5	100.0	117.8	104.2	98.5	...
Chain Relatives	100.0	104.9	118.3	101.0	103.0	96.2	89.0	81.1	81.1	99.1	103.3	101.8	106.5
Adjusted ...	100.0	104.8	116.9	99.4	101.2	93.4	86.8	80.7	80.2	93.0	97.3	95.3	...
Seasonal Index	104.4	108.8	122.0	103.8	105.6	97.5	90.6	84.2	83.7	98.0	101.6	99.5	...

TABLE 2B. SEASONAL INDICES OF DERIVED IMPORT QUANTA FIGURES.

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
1933	115.0	85.4	116.2	85.3	99.2	91.8	90.4	111.1	85.0	127.5	85.4	91.1	...
1934	110.6	89.6	115.2	100.0	103.9	93.5	98.5	106.2	92.0	129.9	87.8	92.4	...
1935	121.8	85.8	102.9	100.0	103.6	80.8	111.5	106.6	91.0	117.4	103.4	81.0	...
1936	139.7	73.7	95.0	106.8	83.8	95.6	104.6	86.0	108.5	107.1	102.2	87.9	...
1937	122.1	77.9	139.7	122.8	87.4	93.1	109.8	96.7	92.4	116.3	125.0	...	...
Mediana ...	121.8	85.4	115.2	100.0	99.2	85.1	104.0	106.2	92.0	117.4	102.2	89.5	...
Chain Relatives	100.0	85.4	98.4	98.4	97.0	90.1	94.2	100.0	92.0	108.0	110.4	98.8	120.8
Adjusted ...	100.0	84.1	95.9	93.8	91.0	83.2	85.0	89.4	81.0	93.6	94.2	83.0	...
Seasonal Index	111.8	93.9	106.4	104.7	102.2	92.0	95.5	99.8	90.4	104.8	105.1	92.6	...

In view of the fact that the period under consideration starts with the revival and ends with the recession we may expect the records to show an uninterrupted upward movement, it has been thought advisable to fit a straight line trend. As proportionate increases are likely to give a clearer picture in the present cases, the logarithmic form has been chosen.

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The actual equations for exports and imports respectively are:—

$$\text{Log } y = 1.2691 + .0030 t \dots\dots (1'1)$$

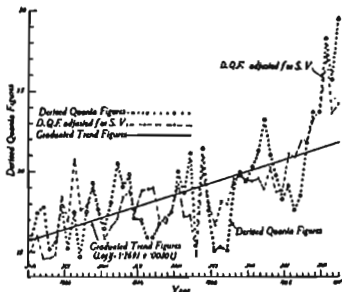
$$\text{Log } y = 1.1235 + .0016 t \dots\dots (1'2)$$

'y' being the trend values of exports and imports respectively, and 't' being measured in months from the middle of the period, viz., February, 1935.

We cannot, however, say definitely that the gradient for exports is higher than that of imports, for the observed difference may be due to errors of sampling. It is well known that the successive terms of a time series are mutually correlated and therefore the ordinary theory of random sampling is not applicable. At the same time it should be remembered that the raw data were adjusted for variations in prices and seasonal fluctuations before the gradients were calculated. It may not therefore be wholly illegitimate to use the method of analysis of variance. The relevant data given on the next page show that the difference in the two gradients may be considered significant.

Export and import figures calculated with the help of the two regression equations are shown in columns (10) and (11) of Table 1. These two series as well as the original data given in columns (6) and (7) are shown graphically in Charts 1 (a) and 1 (b), for export and import respectively.

CHART 1 (a). TREND OF EXPORTS



It appears therefore that in the period under review exports rose proportionately at a faster rate than imports. We get the same result even if the data are analysed in a different way. For instance, if we fit ordinary straight lines instead of logarithmic straight lines to the figures in columns (8) and (9), we get

$$y = 18.8 + .1347 t \dots\dots (2'1)$$

$$y = 13.35 + .0490 t \dots\dots (2'2)$$

showing a higher rate for exports than for imports.

CHART 1 (b). TREND OF EXPORTS.

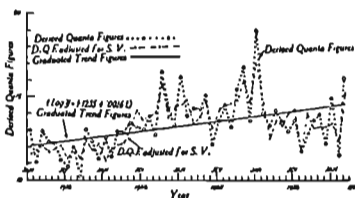


TABLE 3. ANALYSIS OF VARIANCE. LOGARITHMIC TREND.

Factor of Variation	D. F.	Sum of Squares	Observed Variance	Ratio of Variances	
				Observed	One p.e.
EXPORT					
Linear Regression ...	1	0'101530	0'101530	69'56	7'17
Deviation from Regression	49	0'071498	0'001459		
Total ...	50	0'173028			
IMPORT					
Linear Regression ...	1	0'029400	0'029400	21'65	7'17
Deviation from Regression	49	0'066200	0'001353		
Total ...	50	0'095600			

TABLE 4. ANALYSIS OF VARIANCE. ORDINARY TREND.

Factor of Variation	D. F.	Sum of Squares	Observed Variance	Ratio of Variances	
				Observed	One p.e.
EXPORT					
Linear Regression ...	1	200'4850	200'4850	44'53	7'17
Deviation from Regression	49	270'5250	4'5005		
Total ...	50	421'0100			
IMPORT					
Linear Regression ...	1	26'5320	26'5320	19'00	7'17
Deviation from Regression	49	65'3480	1'3336		
Total ..	50	01'8700			