ECONOMIC AND BUSINESS STATISTICS

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INDEX OF BUSINESS ACTIVITY IN INDIA

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INTRODUCTION

The need for having some measure of the "general business activity" of a country is now well recognized. Attempts have accordingly been made in recent years to construct an "index of business activity" in every country of importance, though they are not equally satisfactory. For India, there was no index, either of business activity or of industrial production with which business activity is so intimately connected or even of agricultural production, which must obviously be of great importance to a country like India. The position was regarded as unsatisfactory for a long time. In 1934, in their report on 'A Scheme for an Economic Census of India", Bowley and Robertson recommended the publication of an index of industrial production. They however stated that the publication of an index of agricultural production with the existing incomplete and unsatisfactory data was not justifiable. They were also of opinion that industrial production should not be combined with agricultural production into one index.

Several years before the issue of this report, Findlay Shirras[1,2] had made attempts to measure business activity. His latest contribution to the subject is to be found in "Bulletin de l'Institut International de Statistique" (1936, p. 478), where his main idea was to arrive at India's National Income. He combines industrial and agricultural income, without eliminating the effects of price changes. Besides he does not give sufficient details about the data and methods to enable one to judge the accuracy of the results obtained.

Three years after the publication of the Bowley-Robertson report, Sir David Meek,[3] presented a paper on "Some Measure of Economic Activity in India" before the Royal Statistical Society of London. He may be regarded as the pioneer worker on measurement of business activity in India. He agreed with Bowley and Robertson about the incomplete nature of the data available, but was nevertheless of opinion that there was sufficient statistical material to yield an approximate measure of the economic activity of India, which he derived by combining indices relating to agriculture, industry and trade. Though his calculation was based on *annual* data, he realised that in order to be of practical use, these index numbers should be compiled on a *monthly* basis.

The next work on the subject was by Bose,[4] who computed monthly indices after allowing for seasonal changes. He followed in the main the methods adopted by the

"Economist" of London for their index of business activity and obtained substantially similar results.

The last and in a way the most important work on the subject is the "Capital" Index of Industrial Activity in India, issued for the first time in "Capital", dated March 17, 1938. Here also monthly indices are available substantially on lines similar to those of the "Economist". The treatment however is more elaborate than in Prof. Bose's article, and the series is being continuously published every month.

The "Capital" index is the geometric average of 13 indices, classified under 5 broad groups, with different weights for each individual series. The year 1935 has been chosen as the base, and the corresponding weights for the series are given below:

Series			Weights
I.	Industrial Production		43
	(*i*) Cotton Manufactures	9	
	(*ii*) Jute Manufactures	6	
	(*iii*) Steel Ingots	5	
	(*iv*) Pig Iron	8	
	(*v*) Cement	5	
	(*vi*) Paper	3	
	(*vii*) Coal	7	
II.	Internal Trade		... 24
III.	Financial Statistics		... 20
IV.	Foreign and Coastal Trade		... 7
	(*i*) Exports	4	
	(*ii*) Imports	3	
V.	Foreign and Coastal Shipping		... 6
	(*i*) Tonnage Entered	3	
	(*ii*) Tonnage Cleared	3	
	Total		... 100

The three 'value' series, viz. those for cheque clearances and those for exports and imports have been adjusted for price changes, the first on the basis of the mean of Calcutta and Bombay Wholesale Prices Index Numbers and the last two on the basis of Index Numbers of Declared Values of Exports and Imports. The weights are derived from diverse considerations, such as, (*a*) value of gross output, (*b*) volume of production, (*c*) amount of capital invested in particular industries, (*d*) value of goods handled and (*e*) value of volume of transactions. This is perhaps inevitable, for although items such as cheque clearances, production of coal and tonnage cleared are all influenced by business activity, there is no common denominator which can be regarded as reasonably satisfactory for all. It should also be noted that although agriculture is not directly represented in the index, its effect is not entirely absent, as the character of the agricultural activity is reflected at least to some extent in some of the component series *e.g.*, internal and foreign trade, cheque clearances etc.

General Criticism

It is generally recognized that an index number should be computed on a sufficiently wide basis to ensure its representative character, though it may not be possible to follow this principle always. It will be seen that *sugar* and *tea* have been omitted from the list of industries. Sir David omitted them because he had included them under agriculture. Their inclusion in the "Capital" index therefore seems to be desirable, particularly as monthly data relating to their output are available. In the next place, for an index of business activity, consumption figures are clearly preferable to production data. But even when consumption figures are available, e.g. for cotton, they have not been utilized for the "Capital" index.* Again, other features like the absence of a census of production, absence of detailed employment statistics (annual data alone being available), and absence of an index number of prices with a base sufficiently near to the present time materially detract from the usefulness of the "Capital" index or for the matter of fact any other index. So far as the declared values of exports and imports are concerned, the base is now 1927-28, a year of comparative stability during recent times, but for wholesale prices, the base is still July, 1914. The procedure of taking the mean of Calcutta and Bombay indices in order to arrive at the all-India index number of wholesale prices seems to be also open to criticism.

Inspite of these theoretical imperfections, the index has worked well in practice, and has generally come to be recognized as satisfactory. The League of Nations also have recently accepted the "Capital" sub-indices for industrial production figures for (*a*) coal, (*b*) cotton, (*c*) jute, (*d*) steel ingots, (*e*) pig iron, (*f*) cement and (*g*) paper in their "Statistical Year Book" for 1938-39 (p. 185). It should be noticed, however, that neither "Capital" nor the League of Nations authorities have thought it advisable to compile an index number of industrial production on the basis of these series and their relative weights, apparently because the industries dealt with do not seem to cover a sufficient proportion of the total industrial production of India.† In view of the practical usefulness of the index, however, it seems worthwhile to subject the index to a detailed analysis.

Problem of Business Measurement

It is well known that every economic series is influenced by three types of changes; seasonal fluctuations, secular trend and business cycle, besides influences of a random nature. For considering business cycles therefore not only must seasonal fluctuations be eliminated but the secular trend must also be allowed for. It will be seen that although each component series has been corrected for the seasonal factor, a twelve monthly moving average has been computed for the final index. This cannot evidently be for adjustment of seasonal fluctuations, but is presumably designed to get at the trend, or, more appropriately the moving norm, from which the deviations should be measured for studying business cycles. An example will make the point clear. Compared to 1932, the production of sugar has gone up so enormously that even in a year of depression, the industry will record a better output than in 1932. But that will not prove that there is prosperity in the industry. It is therefore clear that the trend should be as accurately determined as possible and eliminated for measuring business cycles.

* Since the article was written, consumption figures have in some cases been taken into account in preference to production figures, *e.g.*, consumption of raw cotton in place of cotton manufactures.

† The "Capital" index is now called the Index of Industrial Activity, the change of name taking place, after this paper was written.

TRENDS OF THE DIFFERENT SERIES

To get at the law of growth, a logarithmic trend is to be preferred to an ordinary trend, the more so as we are working throughout not with ordinary quantities but with index numbers, showing percentage changes from the 1935 level. It is recognized on all hands that the period of 51 months from January 1933, to March 1937, to which the present study was mainly confined, was one of uninterrupted progress. We have therefore fitted a logarithmic straight line for this period to the thirteen sub-indices as well as the general index number, the origin being the middle of the period, viz. February, 1935 and t, the unit of time being a month in each case. The resulting equations are given in Table 1.

TABLE 1. LOGARITHMIC LINEAR TRENDS OF "CAPITAL" INDEX AND OF THE COMPONENT SERIES

Index	Trend	Index	Trend
Pig Iron	... $1\cdot9657+0\cdot0045\ t$	Coal	... $1\cdot9772+0\cdot0012\ t$
Steel Ingots	... $1\cdot9702+0\cdot0027\ t$	Inland Trade ...	... $1\cdot9945+0\cdot0019\ t$
Cotton manufactures ...	... $1\cdot9809+0\cdot0021\ t$	Cement	... $1\cdot9595+0\cdot0053\ t$
Jute manufactures ...	... $2\cdot0069+0\cdot0032\ t$	Paper	... $1\cdot9867+0\cdot0015\ t$
Cheque clearances ...	... $1\cdot9842+0\cdot0014\ t$	Shipping, tonnage entered	... $1\cdot9871+0\cdot00057\ t$
Exports	... $2\cdot0084+0\cdot0028\ t$	Shipping, tonnage cleared	... $1\cdot9898+0\cdot00055\ t$
Imports	... $1\cdot9738+0\cdot0015\ t$	General Index ...	... $1\cdot9845+0\cdot0022\ t$

(Unit—Calendar month, Origin—February 1935)

DEVIATIONS FROM TRENDS

For measuring business cyles, the deviations were obtained in the following way. For each series, we have a calculated value for each month as given by the equation of the logarithmic trend and an actual value as given by the logarithm of the figure for the month in question. The difference of these two logarithms measures the percentage deviation or business cycle logarithmically, and has been termed "logarithmic deviation" in this paper. An adjustment is however necessary, as the deviations of the different series are not mutually comparable until allowance is made for the varying standard deviations of the different series. In Table 2, for each of the thirteen individual series, "logarithmic deviations" divided by their respective standard deviations are given for the 51 months from January, 1933 to March, 1937. These 'standardised' logarithmic deviations serve as satisfactory measures of business cycle, and are mutually comparable. For getting at corresponding figures for the resultant of these components, a weighted average of these thirteen standardised logarithmic deviations should be computed. For practical purposes, however, this is not necessary. We may compute the standardised logarithmic deviations of the general index number which will come practically to the same thing, provided our trends have been reasonably accurate.

COMPARISON OF STANDARDISED DEVIATIONS

The resemblance between the general index number series on the one hand and the thirteen individual series on the other is sufficiently close to lead to the conclusion that whatever might be their theoretical basis, and however heterogeneous they might be, they

TABLE 2. STANDARDISED LOGARITHMIC DEVIATIONS OF CAPITAL 'GENERAL' INDEX AND OF THE COMPONENT SERIES

	Pig Iron	Steel Ingots	Cotton Manufactures	Jute Manufactures	Cheque Clearances	Exports	Imports
1933							
January	+ 0·37	− 1·22	+ 1·38	+ 1·16	+ 0·52	− 0·12	− 0·48
February	− 1·14	− 2·20	− 0·14	+ 1·36	+ 1·28	+ 0·30	− 0·03
March	− 1·99	− 1·36	+ 0·92	+ 2·31	+ 1·45	− 0·97	+ 0·48
April	− 0·84	− 0·87	− 2·13	+ 0·52	− 0·77	− 0·59	− 0·97
May	− 1·35	− 1·04	− 0·67	+ 1·71	+ 1·13	− 0·38	− 0·50
June	− 1·42	− 0·15	+ 0·16	+ 1·02	− 0·37	+ 1·17	− 0·33
July	+ 0·22	+ 1·89	− 0·42	− 0·86	− 1·32	+ 0·37	− 0·87
August	− 0·20	− 0·33	− 0·34	+ 0·86	− 0·87	+ 1·86	− 0·14
September	− 0·21	− 0·55	− 0·41	− 1·07	− 2·25	+ 0·53	− 1·40
October	+ 0·29	+ 1·02	− 1·25	− 0·33	− 0·47	+ 0·05	− 0·85
November	− 0·30	+ 0·05	− 0·44	− 0·35	− 0·65	+ 0·87	− 1·48
December	+ 0·23	− 0·52	− 0·88	− 1·17	+ 0·13	+ 0·07	− 0·65
1934							
January	− 0·15	− 0·98	− 1·48	− 0·37	− 0·89	− 2·10	− 2·02
February	+ 0·51	− 0·22	− 0·67	− 0·03	+ 0·39	− 0·02	− 0·39
March	− 0·57	− 0·16	+ 0·08	− 0·29	+ 0·79	+ 0·22	+ 0·25
April	− 0·37	+ 0·76	− 0·95	− 0·26	− 1·32	+ 1·60	− 0·27
May	+ 1·09	+ 0·82	− 1·92	− 0·67	+ 0·23	+ 1·29	+ 0·55
June	+ 1·80	+ 1·38	− 0·72	− 0·75	− 0·82	+ 0·54	+ 1·29
July	+ 0·44	+ 0·36	+ 0·53	− 0·78	− 0·01	+ 1·12	+ 0·65
August	+ 0·37	+ 1·05	+ 1·29	− 0·39	+ 0·29	+ 0·62	+ 1·26
September	+ 0·65	− 0·49	+ 1·37	− 1·09	+ 1·76	+ 1·13	+ 0·81
October	+ 1·73	+ 0·85	+ 2·31	− 0·57	+ 0·52	− 0·05	+ 2·25
November	+ 1·47	+ 0·77	+ 1·73	− 0·51	+ 0·69	− 0·97	+ 0·85
December	+ 1·07	+ 1·09	+ 1·99	− 0·97	+ 1·92	− 0·85	+ 1·72
1935							
January	− 0·31	+ 1·64	+ 1·50	− 0·37	− 0·22	+ 0·20	+ 1·51
February	− 0·78	+ 1·14	+ 0·69	− 0·24	+ 0·30	− 0·70	+ 1·53
March	− 0·83	+ 0·10	+ 0·11	− 0·74	− 0·33	− 1·10	− 0·12
April	+ 0·24	+ 0·58	+ 0·25	+ 0·75	− 0·38	− 2·16	− 0·55
May	− 0·74	− 0·68	+ 1·08	− 0·55	− 0·34	+ 0·80	+ 0·54
June	− 0·27	− 0·28	+ 0·20	− 1·42	+ 1·37	− 0·15	− 0·70
July	+ 1·05	+ 0·62	+ 0·05	− 0·39	+ 1·83	− 1·84	− 0·16
August	+ 0·86	+ 0·66	+ 0·29	− 1·47	+ 1·78	− 1·00	+ 0·53
September	+ 1·02	+ 1·01	− 0·12	− 0·87	+ 0·68	− 1·40	+ 0·67
October	+ 1·26	− 0·11	+ 0·04	− 0·50	+ 0·08	− 0·07	+ 0·80
November	+ 1·27	+ 0·53	+ 0·88	− 1·74	− 0·90	− 0·21	+ 1·43
December	+ 1·04	+ 0·79	+ 0·16	− 1·13	+ 0·17	− 0·24	+ 0·43
1936							
January	+ 1·15	+ 1·69	− 0·18	− 1·31	− 1·25	− 0·67	+ 1·52
February	+ 1·20	+ 1·09	+ 0·09	− 1·02	− 0·94	− 0·13	+ 0·64
March	+ 0·17	− 0·02	+ 0·06	− 0·86	− 1·59	− 0·09	− 0·74
April	+ 0·06	− 0·80	+ 0·46	+ 1·25	− 1·64	+ 0·49	+ 0·15
May	+ 0·42	− 0·36	+ 0·86	− 0·11	+ 0·34	− 0·71	+ 0·05
June	+ 0·18	− 0·36	+ 0·77	+ 0·77	− 0·49	− 1·52	+ 0·01
July	− 1·11	− 2·24	− 0·08	+ 1·37	− 0·42	+ 0·14	+ 0·38
August	− 0·66	− 0·96	− 1·26	+ 0·75	− 1·04	− 1·02	− 1·62
September	− 1·11	+ 0·33	− 0·86	+ 2·08	− 0·33	− 0·14	− 0·14
October	− 1·60	− 0·49	− 1·42	+ 1·25	− 0·38	− 0·38	− 1·70
November	− 1·94	− 1·12	− 2·07	+ 0·83	+ 1·44	+ 0·44	− 1·61
December	− 1·60	− 1·15	− 1·14	+ 1·69	+ 0·47	+ 0·67	− 1·11
1937							
January	− 1·51	− 2·12	+ 0·12	+ 0·93	+ 1·42	+ 2·32	− 0·58
February	− 0·80	− 0·46	+ 0·06	+ 0·29	− 0·93	+ 1·14	− 1·53
March	+ 1·32	+ 0·84	+ 0·02	− 0·03	− 0·32	+ 2·07	+ 0·78

TABLE 2. STANDARDISED LOGARITHMIC DEVIATIONS OF 'CAPITAL' GENERAL INDEX AND OF THE COMPONENT SERIES. *(Contd.)*

	Coal	Inland Trade	Cement	Paper	Shipping Tonnage Entered	Shipping Tonnage Cleared	General
1933							
January	− 0·96		+ 0·98	− 1·42	− 0·09	− 1·20	− 0·01
February	− 1·09		− 0·31	− 0·58	− 1·87	− 1·35	− 0·83
March	− 0·20		+ 0·37	+ 0·06	− 2·31	− 1·16	− 0·29
April	− 0·97	− 2·29	− 1·63	+ 0·14	− 1·43	− 2·03	− 2·70
May	− 0·59	+ 0·53	+ 0·88	+ 0·98	− 0·53	− 1·13	+ 0·18
June	− 0·53	− 0·86	− 1·83	+ 0·08	− 0·55	− 0·47	− 0·96
July	− 1·31	+ 0·74	− 2·66	− 0·41	− 0·95	− 1·22	− 0·98
August	+ 0·58	+ 2·13	+ 0·71	+ 0·38	− 0·21	+ 0·25	+ 0·77
September	− 1·30	− 0·74	+ 0·55	+ 0·42	− 0·76	− 0·38	− 1·80
October	− 1·12	− 1·82	− 1·36	+ 0·93	− 0·70	− 1·06	− 1·31
November	− 0·23	+ 0·28	+ 0·07	+ 1·35	− 1·64	− 1·01	− 0·41
December	− 0·27	− 0·65	− 0·70	− 0·63	+ 0·81	+ 0·85	− 0·56
1934							
January	− 0·72	− 1·45	+ 2·01	+ 0·51	+ 0·54	+ 0·72	− 1·44
February	− 0·87	+ 1·43	+ 0·16	− 1·04	+ 1·43	+ 1·76	+ 0·74
March	− 0·01	+ 1·44	− 0·12	+ 1·08	+ 1·35	+ 1·19	+ 0·94
April	+ 0·13	− 0·27	+ 0·18	+ 0·13	+ 0·41	+ 0·73	− 0·49
May	+ 1·12	+ 1·35	− 0·65	− 0·70	+ 0·71	+ 0·71	+ 1·12
June	+ 0·80	+ 0·28	− 0·80	+ 0·15	+ 1·68	+ 1·48	+ 0·59
July	+ 0·49	+ 0·88	+ 1·58	− 1·74	+ 0·43	+ 0·74	+ 1·02
August	+ 0·81	+ 0·77	+ 0·39	− 1·43	+ 1·07	+ 0·67	+ 1·28
September	+ 1·13	+ 2·01	+ 0·20	+ 0·03	+ 1·30	+ 1·27	+ 2·22
October	+ 1·78	+ 0·45	+ 1·37	+ 1·23	+ 2·79	+ 2·31	+ 2·36
November	+ 0·78	− 0·09	+ 0·22	− 0·93	+ 1·52	+ 1·57	+ 1·32
December	+ 1·00	+ 0·46	− 0·08	− 0·60	− 0·17	+ 0·01	+ 1·82
1935							
January	+ 1·47	+ 1·02	− 1·45	− 0·32	+ 0·78	+ 1·15	+ 0·99
February	+ 1·18	− 0·65	+ 1·43	− 0·50	+ 0·35	+ 0·46	+ 0·48
March	+ 1·22	− 1·39	+ 1·40	− 1·50	+ 1·45	+ 1·94	− 0·36
April	+ 0·84	− 0·51	− 0·14	+ 1·00	+ 1·24	+ 1·27	+ 0·01
May	+ 0·78	+ 0·04	− 0·92	+ 1·38	+ 0·44	+ 0·70	− 0·02
June	+ 0·20	− 0·07	+ 0·88	− 0·14	− 1·30	− 0·77	+ 0·19
July	+ 0·70	− 0·61	+ 0·33	+ 2·06	+ 0·72	+ 0·21	+ 0·94
August	+ 1·05	− 0·54	+ 0·05	+ 0·76	− 0·17	+ 0·13	+ 0·50
September	− 0·32	− 0·45	+ 1·83	+ 0·70	− 0·06	− 0·88	+ 0·44
October	− 0·11	+ 1·16	+ 0·35	+ 1·08	− 0·28	− 0·39	+ 0·79
November	+ 1·47	+ 0·51	+ 0·31	+ 1·81	+ 0·91	+ 0·02	+ 0·60
December	+ 0·56	− 0·83	+ 0·93	+ 0·80	− 0·45	− 1·60	+ 0·10
1936							
January	+ 1·30	− 0·44	− 1·45	+ 0·46	− 1·35	− 1·07	− 0·47
February	+ 1·50	− 0·84	+ 0·26	+ 1·54	+ 0·07	− 0·82	− 0·05
March	− 0·28	− 0·98	− 0·49	− 0·82	− 0·45	− 0·97	− 1·40
April	+ 0·48	− 0·55	+ 0·69	− 0·04	− 0·19	− 0·23	− 0·48
May	+ 0·27	− 1·45	+ 0·10	− 1·39	− 0·26	+ 0·06	− 0·28
June	− 0·04	− 0·36	+ 0·53	0·00	+ 0·32	− 0·14	− 0·15
July	− 0·65	− 0·30	+ 0·18	+ 0·02	+ 0·10	+ 0·44	− 0·61
August	− 0·05	− 0·03	− 0·63	+ 0·39	− 0·80	− 0·81	− 1·28
September	+ 0·45	− 1·34	− 2·30	− 0·69	− 0·20	+ 0·29	− 0·94
October	− 0·58	+ 0·05	− 0·20	− 2·59	− 0·79	− 0·02	− 1·08
November	− 3·15	− 0·20	+ 0·27	− 2·03	− 0·45	− 0·34	− 0·96
December	− 1·74	+ 1·21	+ 0·01	+ 0·47	− 0·67	− 0·17	− 0·22
1937							
January	− 1·47	+ 1·12	+ 0·38	− 0·47	− 0·41	+ 0·07	− 0·62
February	− 1·05	+ 0·75	− 1·10	− 0·57	− 0·79	− 0·33	− 0·76
March	− 0·43	+ 1·26	− 0·75	+ 0·36	− 0·80	+ 1·48	+ 0·70

are all good indicators of business activity. At the same time, it is also to be noticed that all the different series do not reflect the business conditions to the same degree. For instance the resemblance with internal trade, pig iron, cement and cotton manufactures seems to be much closer than with tonnage entered or tonnage cleared.

Correlation Coefficients

It may be argued that so many adjustments have been made with raw data that their nature and significance may have been interfered with. To check up the conclusions reached from the standardised logarithmic deviations, the mutual correlation coefficients between the general index number series and the thirteen component series are given in Table 3. It will be seen that the highest correlation coefficient is obtained in the

Table 3. Correlation Coefficients between the Capital General Index and the Component Series

	Pig Iron	Steel	Cotton	Jute	Cheques	Exports	Imports	Coal	Inland Trade	Cement	Paper	Shipping Entered	Shipping Cleared
Steel ingots	·8781												
Cotton manufacs.	·8063	·6599											
Jute manufacs.	·5602	·3945	·5825										
Cheque clearances	·4994	·2811	·6081	·5283									
Exports	·6232	·4886	·5867	·6500	·4332								
Imports	·6726	·6554	·7462	·1623	·4277	·3694							
Coal	·6731	·6453	·6950	·2351	·2439	·2109	·7972						
Inland Trade	·7295	·6468	·7331	·7400	·6399	·8341	·4837	·3769					
Cement	·8005	·6249	·7824	·7463	·6469	·6617	·4768	·4825	·7602				
Paper	·7877	·6334	·7054	·6916	·5384	·6520	·5262	·5670	·7301	·8162			
Shipping Tonnage entered	·3597	·2488	·3686	·0093	·1580	·0801	·4761	·4718	·2053	·2770	·1784		
Shipping Tonnage cleared	·1978	·1429	·3085	·0516	·3472	·1009	·3577	·4537	·1691	·2110	·1021	·8913	
General index	·8984	·7345	·8852	·7270	·7019	·7546	·6796	·6457	·9062	·8975	·8589	·3852	·3359

For 5% level of significance when $n = 49$, correlation coefficient should not be below 0·276 and for 1% level it should not be below 0·357.

case of internal trade, closely followed by pig iron, cement and cotton manufactures and the two lowest are tonnage entered and tonnage cleared. All these correlation coefficients but one are significant at 1 per cent level. The correlation coefficient between the general index number and the tonnage cleared is only significant at the 5 per cent level. It is quite true that it is not legitimate to apply such tests of significance to mutually correlated items of a time series. But at the same time it is equally true that if a correlation coefficient falls below such limits of significance, its validity becomes all the more open to doubt.

INTERNAL AND EXTERNAL CHECKS

We have been discussing so long the question of agreement or consistency between general index of business activity and their several components. This does not however remove the disability that although all of them may indicate the same thing, they may not indicate business activity at all. We have therefore to check up the index number of business activity with an independent measure of such activity, arrived at from altogether different considerations. In other countries, such independent checks are provided by figures for real National Income, that is to say the nominal National Income adjusted for variation in the purchasing power of money. Unfortunately for India we are still without satisfactory figures even for the nominal annual income calculated on the same basis for a number of years. The most recent work on the subject, is Dr. V. K. R. V. Rao's "Essay on India's National Income". It is on a wider and a more comprehensive basis than previous estimates, but the figures only relate to the average of the years 1925-26 to 1929-30.* It is therefore not possible to use National Income figures for checking up the validity of the "Capital" index.

VARIABLE YIELD SECURITY

It is an undoubted fact that profits rise or fall in accordance with general business prosperity or decline. Such profits are reflected not only for the immediate past but also for the near future in the price of variable yield securities. For operators in the share market are guided not only by the dividends actually paid for the last half year but also by the dividends which may be expected as a result of future business conditions at the time of the next half year's accounting. It is true that sentiment plays a large part in the reading of the past and in the discounting of the future, and there is generally a tendency of exaggeration both in optimism and pessimism. This is not perhaps a disadvantage, for market psychology is a factor, which is also operative in connection with business cycles. It is thus clear that though the index number of variable yield securities is generally a very good indicator of business conditions, the movement of the two series are likely to differ to some extent owing to the following reasons:—

(1) the market price of securities for a particular period reflects not only the business conditions for that period, but also that for several months ahead;

(2) the amplitude of fluctuations of security prices will be much more pronounced than that of business conditions generally.

It may therefore, be interesting to compare the fluctuations of business activity with those of variable yield securities and to see how far the results agree with such *a priori* considerations.

LAG OF BUSINESS BEHIND SECURITY PRICE

For forecasting purposes, a detailed study is necessary in order to measure the lag of business or what comes to the same thing the lead of security price. In the "Monthly Survey of Business Conditions in India" index numbers of prices of variable yield securities are being published from 1927-28 onwards with the year 1927-28 as the base; but these are not corrected for the seasonal factor before publication. The method of

* The National Income of India for 1931-32, by the same author was published after this article had been written.

construction has been described in the "Survey" for April, 1937, pp. 29-30. We have taken 12-monthly average as the trend and the arithmetic means of the percentage deviations from that trend have been utilised for the seasonal factors given in Table 4.

TABLE 4. SEASONAL FACTORS FOR VARIABLE YIELD SECURITY INDEX.

Month	Seasonal Factor	Month	Seasonal Factor	Month	Seasonal Factor	Month	Seasonal Factor
January ...	101·5	April ...	99·7	July ...	100·8	October ...	99·4
February ...	101·1	May ...	100·6	August ...	99·3	November ...	99·7
March ...	99·0	June ...	100·0	September ...	98·7	December ...	100·5

The correlation coefficients between the variable yield securities index and the "Capital" index of business activity with lags from one to six months are given in Table 5. It will be seen that the maximum correspondence is obtained in the case

TABLE 5. CORRELATION COEFFICIENT BETWEEN VARIABLE YIELD SECURITY INDEX AND CAPITAL GENERAL INDEX.

Lag in months	Correlation Coefficients	Lag in months	Correlation Coefficients
1 ...	... 0·8087	4 ...	... 0·8453
2 ...	... 0·8140	5 ...	... 0·8383
3 ...	... 0·8543	6 ...	... 0·8336

of three months which is equally distant from the time of last accounting as well as from that of the next accounting.

DIFFERENT ESTIMATES OF BUSINESS ACTIVITY

It is therefore clear that the variable yield securities index number may be used for forecasting general business conditions three months ago, subject to the proviso mentioned above that the amplitude of the former will be more pronounced than that of the latter. This is done in Table 6. For purposes of comparison, estimates on the basis of internal trade, pig iron and cotton manufactures are given along with the general Index Number. Unfortunately cement data which are so highly correlated as shown above have now been discontinued, and it was therefore not thought advisable to make any estimate from the cement data. The figures given in Table 6 show clearly that the resemblance with variable yield securities is not so close as with the other three series. This is not surprising, for an element of the *future* is inherent in this series, whereas the others represent only the present and the immediate past. On the other hand, the variable-yield securities Index Number stands far superior to the rest for forecasting purposes, because the general trend of business is roughly known about three months ahead.

VOLUME OF AGRICULTURAL PRODUCTION IN INDIA

It has been pointed out above that the "Capital" index of business activity concerns itself mainly with industries and includes agriculture only indirectly through series such as those for internal and external trade. But India is a country so predominantly agricultural that it seems desirable to compare the fluctuations in industry with that in agriculture. That being accepted, the question arises whether the *value* figures or *quantity* figures should be used. For the "Capital" index, quantity figures have been taken as far as possible and the few value figures included have been adjusted for price changes. This is necessary, for an index of business activity properly constructed should reflect

real as distinguished from *nominal* National Income as stated above. It therefore follows that for agriculture we should consider quantity figures and not value figures. This is all the more desirable, as it is well known that a considerable part of the food crops is consumed by the producers themselves, making them independent of the ruling market price. At the same time a *caveat* seems to be clearly necessary. The essentially inelastic nature of agricultural production, specially in a country like India may record the same output even in a year of great depression, and may accordingly hide the acuteness of

TABLE 6. CAPITAL 'GENERAL' INDEX AND ITS ESTIMATES DERIVED FROM OTHER SERIES

'Capital' General index	Estimates from :				'Capital' General index	Estimates from :			
	Internal Trade	Pig Iron	Cotton manufac-tures	Variable Yield Security		Internal Trade	Pig Iron	Cotton manufac-tures	Variable Yield Security
85·0		88·1	91·7		97·8	94·4	93·7	98·8	105·7
83·5		84·5	86·0		96·0	92·3	93·9	96·6	108·0
85·2		82·8	90·6		97·5	95·7	97·9	97·7	113·1
80·5	61·4	85·9	79·4	77·4	97·9	98·0	95·0	101·9	110·6
87·2	90·6	84·9	85·1	78·5	99·0	98·0	96·9	98·3	107·4
					101·6	96·5	102·3	98·0	101·4
84·9	86·5	84·9	88·6	79·9	100·9	97·2	102·1	99·5	105·7
85·3	92·1	89·7	86·7	82·3	101·2	97·9	103·1	98·1	104·9
90·0	97·3	88·9	87·4	82·8	102·7	104·3	104·6	99·2	103·5
84·2	87·9	89·1	87·5	85·1	102·7	102·2	105·1	103·5	99·2
85·8	84·8	90·9	84·6	85·8					
					101·8	97·7	104·7	100·6	99·9
88·4	92·0	90·4	88·1	87·5	100·7	98·5	105·6	99·5	102·2
88·5	89·3	91·5	86·7	87·3	102·4	98·4	104·4	101·2	103·8
86·8	87·0	90·7	84·8	88·1	99·1	98·3	102·7	101·4	102·9
92·7	97·1	93·1	88·3	87·0	102·2	100·3	102·7	103·8	100·3
93·7	97·6	90·2	91·7	87·0					
					103·3	97·4	104·7	106·2	100·0
90·5	92·0	91·1	90·0	84·8	104·2	101·9	104·1	104·2	100·3
95·1	98·0	96·2	84·5	87·6	103·4	102·5	99·6	102·6	101·4
94·2	94·6	99·1	89·6	91·7	102·0	103·9	101·8	97·6	102·4
95·8	97·1	94·8	95·2	93·4	103·5	99·4	100·5	99·8	103·8
97·0	97·1	95·0	99·0	94·0					
					103·6	105·1	99·2	97·7	107·3
100·1	102·1	96·0	99·8	94·2	104·5	104·6	98·5	95·2	107·6
101·0	96·8	100·6	104·7	94·3	107·2	110·6	100·1	99·8	107·4
98·6	95·3	100·1	102·3	99·2	110·3	110·7	100·9	106·2	106·7
100·5	97·6	99·1	104·0	102·3	106·7	109·6	104·1	106·3	110·2
98·7	100·0	94·8	102·1	105·5	111·7	112·3	114·2	106·6	111·2

agricultural distress. For, during the last depression, agricultural prices sometimes went down by as much as 50 per cent even though the production figures had not materially changed. Thus the cultivator got only half his former income for the non-food crop and for the portion of the food crop not consumed by him, but he had to make practically the same money payment for rent, interest charges etc. His distress was therefore extreme, notwithstanding the fact that his production was not affected to any marked extent. The volume of agricultural production should therefore be considered in the light of the above remarks.

METHOD OF CALCULATION

Sir David Meek had given an estimate of agricultural production in his paper before the Royal Statistical Society. We have practically followed the same procedure subject to two reservations. He used a pre-war base, which is far too distant now to be of much

TABLE 7. INDEX NUMBER OF AGRICULTURAL PRODUCTION

Commodities	Weight	Average production during 1925-26 to 1929-30	1925-26		1926-27		1927-28		1928-29		1929-30		1930-31		1931-32		1932-33		1933-34		1934-35		1935-36		1936-37		1937-38	
			Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.	Production	Index No.
Rice (00.000 tons)	43	255	260	102	246	97	233	91	273	107	261	103	271	106	288	113	262	103	257	101	257	101	232	91	278	109	268	105
Wheat (0.000 tons)	13	890	870	98	897	101	779	87	859	96	1047	118	931	105	902	101	946	106	937	105	973	109	943	106	975	110	1076	121
Barley (0.000 tons)	3	241	258	107	255	106	209	87	252	105	229	95	239	99	239	99	235	98	241	100	251	104	233	97	231	96	209	87
Maize (0.000 tons)	2	206	184	89	188	91	222	108	196	95	241	117	236	115	223	108	211	102	187	91	225	103	223	102	195	90	212	97
Gram (0.000 tons)	4	334	385	116	394	118	318	95	268	80	305	91	340	102	377	113	344	103	374	112	363	103	384	109	412	117	353	100
Sugar (0.000 tons)	7	298	298	100	327	110	322	108	270	90	275	92	323	108	398	134	468	157	490	164	514	173	593	199	648	218	540	181
Tea (000.000 lbs.)	3	397	364	92	393	99	391	98	404	102	433	109	391	99	394	99	434	109	384	97	399	101	394	99	395	100	430	108
Linseed (000 tons)	1	372	402	108	406	109	348	94	322	87	380	102	377	101	416	112	406	109	376	101	420	113	388	104	420	113	461	124
Rape seed (000 tons)	2	952	909	95	1004	106	840	88	910	96	1095	115	988	104	1024	108	1042	110	943	99	900	95	957	101	964	101	1024	108
Sesamum (000 tons)	1	424	376	89	384	91	498	117	455	107	405	96	451	106	446	105	486	115	474	112	352	83	413	97	439	104	465	110
Groundnut (0.000 tons)	5	207	161	78	165	80	227	110	262	127	218	105	259	125	215	104	285	138	319	154	174	84	211	102	271	131	350	169
Jute (00.000 bales)	6	103	89	87	121	118	102	99	99	96	103	100	112	109	55	53	71	69	80	78	85	83	72	70	96	93	87	85
Cotton* (0.000 bales)	10	558	613	110	495	88	590	106	574	103	520	93	519	93	400	72	462	83	506	91	480	86	587	105	618	111	578	104
All India				100		99		96		102		103		105		104		105		106		104		103		116		114
World (1925-29=100)														104		102		105		104		104		108		113		112†

* Maize production increased from 1,670,000 tons in 1933-34 to 2,250,000 tons in 1934-35 but out of the latter figure, 120,000 tons were due to the addition of new acres. To ensure comparability, the figures prior to 1934-35 were computed on the basis of 2,050,000 tons as 100, that being the average for the years 1925-26 to 1929-30, but the figures subsequent to 1934-35 were calculated on the basis of 2,250,000 tons as 103.

† Provisional

practical use. In the second place, he included Burma, which is now a separate territory. As already stated Dr. Rao has made a detailed study of India's National Income including agricultural income from 1925-26 to 1929-30. He has however included Burma and excluded Indian States. We have adjusted his figures, and have arrived at the money values of the different crops for the years 1925-26 to 1929-30 for India (including Indian States and excluding Burma) which we have taken as our "weights" for computing the all-India agricultural index.

Correspondence with World Production

The results obtained are given in Table 7. A statistical difficulty was experienced with regard to certain crops in several years for new areas were reported from time to time. Necessary adjustments were made to obviate this difficulty. For purposes of comparison the index number of world agricultural production as given in the Statistical Year Book of the League of Nations is quoted along with our own index. It will be seen that agriculture in India has followed practically the same course as in the rest of the world.

Conclusions

(1) The trends from January, 1933 to March, 1937 are substantially similar, so far as the "Capital" index and the component series are concerned.

(2) All the constituent series are closely correlated with the general index, except tonnage cleared and tonnage entered* the highest correlations being noticed in the case of internal trade, pig iron and cement ;

(3) The association of the "Capital" index with the official variable yield security index is quite close specially with three months lead in the case of the latter ;

(4) the estimate of business activity derived from the variable yield security index three months ahead is not so good as that derived from simultaneous internal trade, pig iron and cement data and the reason for this discrepancy is stated ;

(5) Dr. Meek's series of index numbers of the volume of agricultural production in India has been reconstructed with a new base, excluding Burma, new figures being obtained from 1925-26 to 1937-38, showing remarkable correspondence with the League of Nations world index number of agricultural production ;

(6) Agricultural activity in India has proceeded differently from the industrial activity, but has been on substantially similar lines to the rest of the world.

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* In the "Capital" index trade and shipping series have been replaced respectively by notes in circulation and consumption of electricity since this article was written.