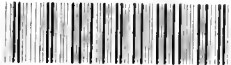


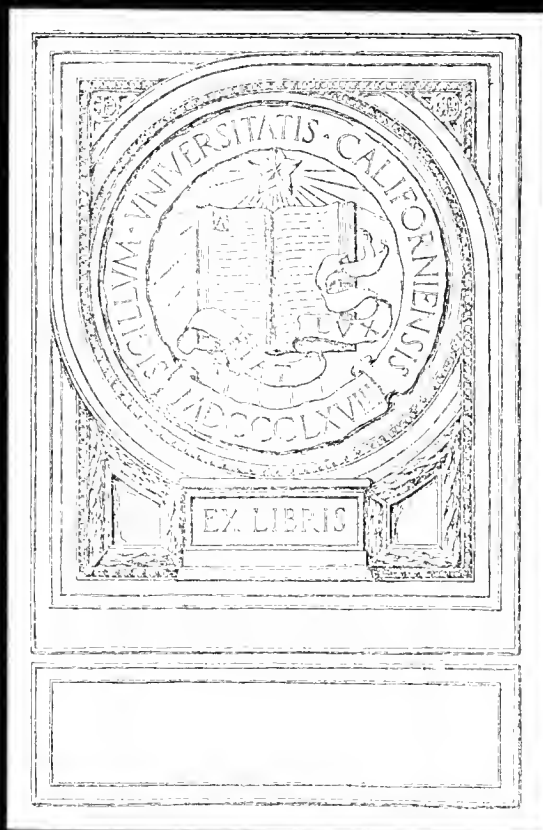
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INTERPRETATION OF THE INDEX OF GENERAL BUSINESS CONDITIONS

BY

WARREN M. PERSONS



HARVARD ECONOMIC SERVICE

CAMBRIDGE, MASS., U.S.A.

1922

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I. BUSINESS CYCLES

THE ebb and flow of industrial activity and trade, the alternation of full employment and unemployment, the rise and fall of prices, wages, profits, and interest rates are familiar characteristics of our economic system. This ebb and flow of economic activity, this alternation of prosperity and depression constitutes the business cycle.

The business cycle is clearly revealed over a period of years by the wave-like variations in the industrial, commercial, and financial statistics which ordinarily serve as a basis for judgments concerning the fundamental speculative, business, and banking situation — for instance, statistics of wholesale commodity prices, rates on commercial paper, pig-iron production, and bank clearings. To illustrate the kind of variations found in business statistics the monthly items of two of the series just named — average wholesale

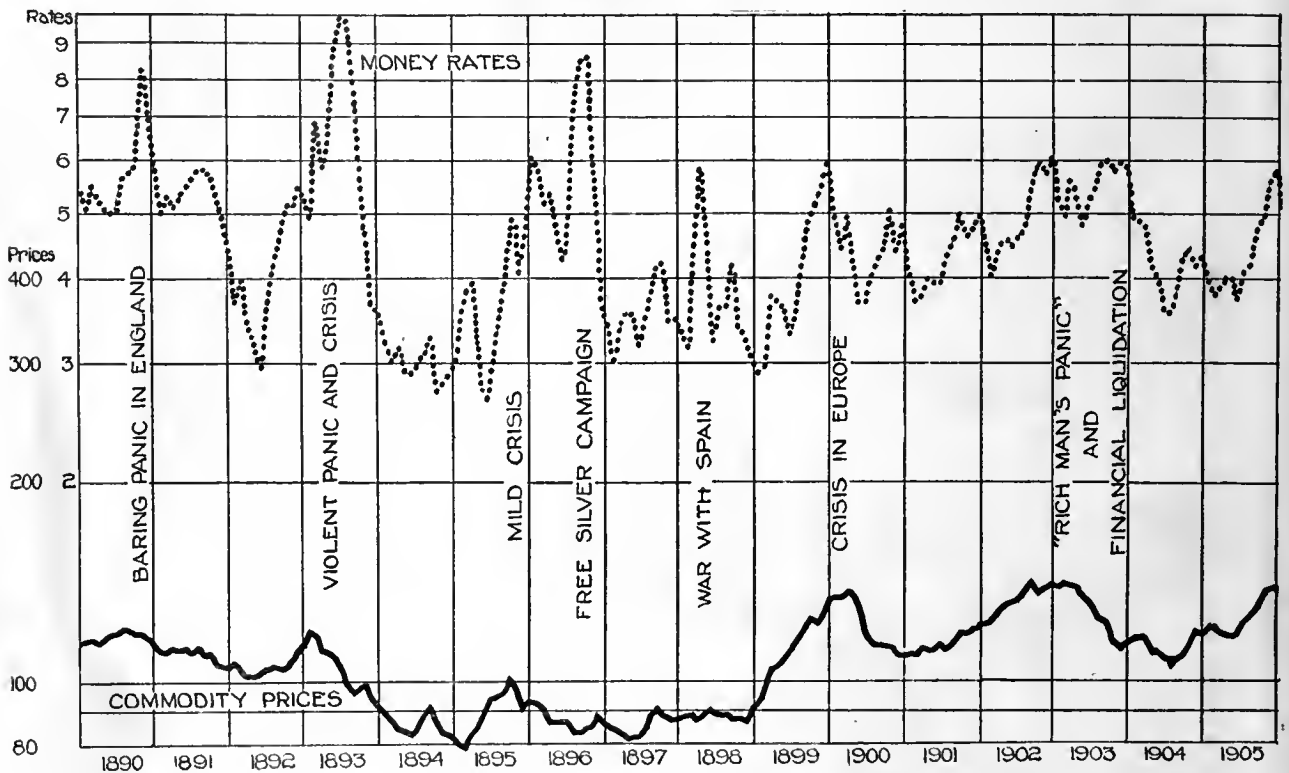
prices and rates on commercial paper — are given for a period of nearly 33 years in the chart at the bottom of this page and the one following.¹

The curve representing wholesale prices shows the average wholesale price of ten commodities selected because, first, they are unusually sensitive to price changes and are not greatly affected by the seasons and second, they are of a varied nature and are important to the industrial life of the country.² The curve representing rates on commercial paper shows the rate on 60-90 day commercial paper in New York. These series

¹ In this chart the logarithmic or ratio scale is used. Consequently, equal percentage changes in each series are represented by equal vertical distances and the differences in the violence of fluctuations of the two curves corresponds exactly to the differences in percentage changes from minima to maxima in the two series.

² The commodities are: cottonseed oil, coke, pig iron, bar iron, pig zinc, mess pork, hides, print cloths, sheetings, and worsted yarns. The prices of these commodities all have similar major fluctuations.

MONEY RATES AND COMMODITY PRICES, 1890-1905
(Ratio scale)



reflect very clearly variations in business prosperity, and the most noticeable feature of the curves is their cyclical movement. They, therefore, are well adapted for use in an index designed to show fluctuations in general business conditions.

A second noticeable feature of the chart is the correspondence of the major wave movements of the two curves. Comparison of these movements shows, however, that the crests of the waves for interest rates appear to follow, in point of time, the high points for commodity prices. But a decision as to the precise relationship between the wave movements, or cyclical fluctuations, of interest rates and wholesale prices during periods of alternating prosperity and depression is made difficult by three disturbing influences: first, a substantial seasonal movement in interest rates during each year, by which the rates are usually low in the summer and high in the autumn, thus disguising the cyclical movements; second, the effects of such unusual events as the free silver campaign of 1896, the outbreak of war with Spain in the spring of 1898, the declaration of war in Europe in July and August 1914, and the

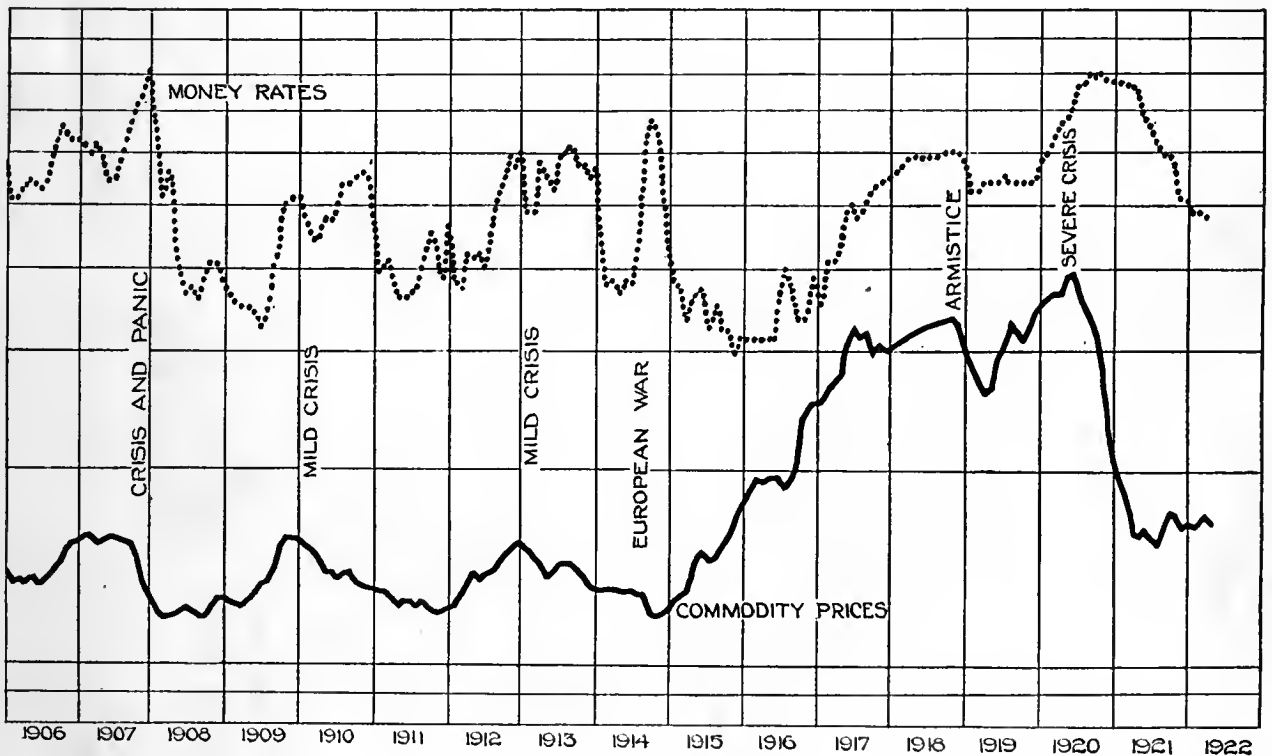
great inflation of prices during the war; and third, the diverse trends of the two series — downward for interest rates and upward for commodity prices — for the whole period covered.

The two statistical series just considered, and many other series connected with speculation and security prices, business activity and commodity prices, or banking and interest rates, reflect, as we have said, cycles of business prosperity and depression, and therefore constitute the raw material for the construction of an index of general business conditions. In order to adapt such raw material to our purpose — the securing of an index which would measure and forecast the ebb and flow of business — two statistical operations had to be performed:

First, methods were devised for eliminating the seasonal influences and long-time movements from the various statistical series utilized; and

Second, the series thus corrected were sorted into groups according to the times at which maximum or minimum points of the cyclical fluctuations were reached.

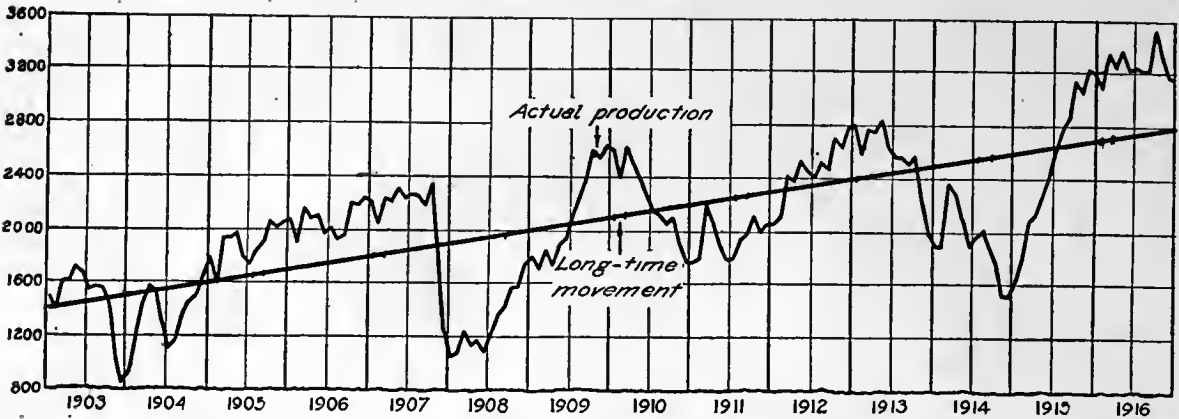
MONEY RATES AND COMMODITY PRICES, 1906-22
(Ratio scale)



4 INTERPRETATION OF THE INDEX OF GENERAL BUSINESS CONDITIONS

CHART I. — PIG-IRON PRODUCTION: ACTUAL FIGURES

(Unit: 1,000 gross tons)

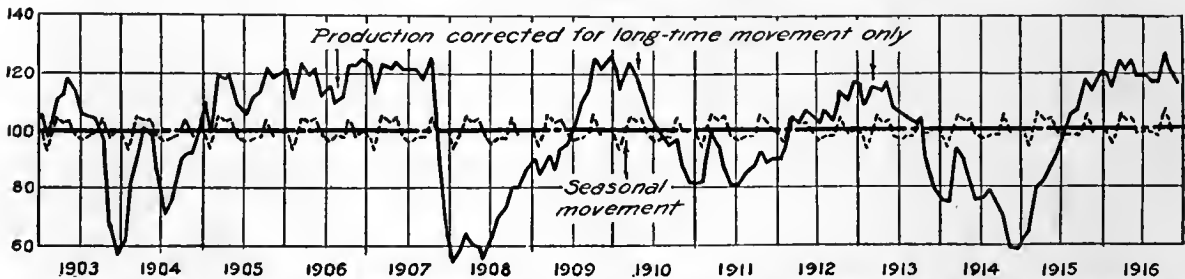


EXPLANATION: The above chart shows the monthly production of pig iron for the years 1903-16. As the United States, throughout this period, grew in population and in the extent of its commercial activities, new iron furnaces were set in operation and there was a gradual expansion in the total output of the nation. This growth element, or long-time movement upward, in the

normal producing capacity of this industry has been represented in the chart by the straight line fitted to the original items. Correction for this influence was accomplished by expressing the actual tonnage manufactured in each month as a percentage of the corresponding "normal" production indicated by the straight line. The resulting figures appear in Chart II below.

CHART II. — PIG-IRON PRODUCTION: FIGURES CORRECTED FOR LONG-TIME MOVEMENT

(Percentages)



EXPLANATION: The solid line on the above chart represents pig-iron production corrected for the long-time movement, but not for the seasonal movement; the dotted line indicates the usual seasonal variation in the output during the year. Correction for the seasonal influence was made by taking the differences between the corresponding items of these two lines;

the results of this subtraction show in each case by how much the actual production, after the long-time movement had been eliminated, exceeds or falls short of the output normally to be expected for that month. These differences (presented in Chart III below) are called "the corrected figures" since both the long-time and seasonal movements have been removed.

CHART III. — PIG-IRON PRODUCTION: CORRECTED FIGURES

(Percentages)

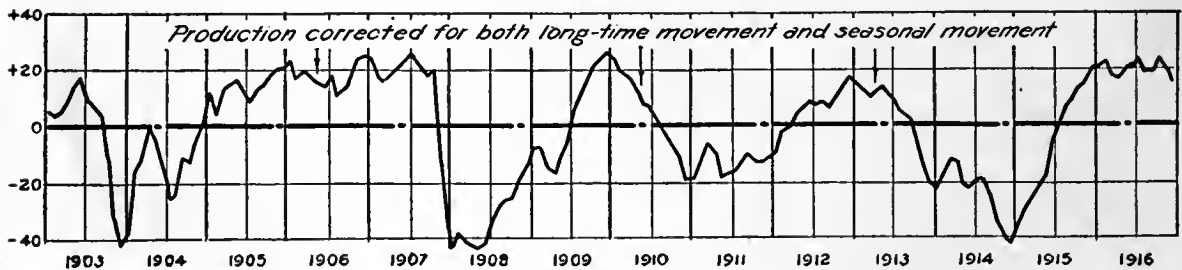
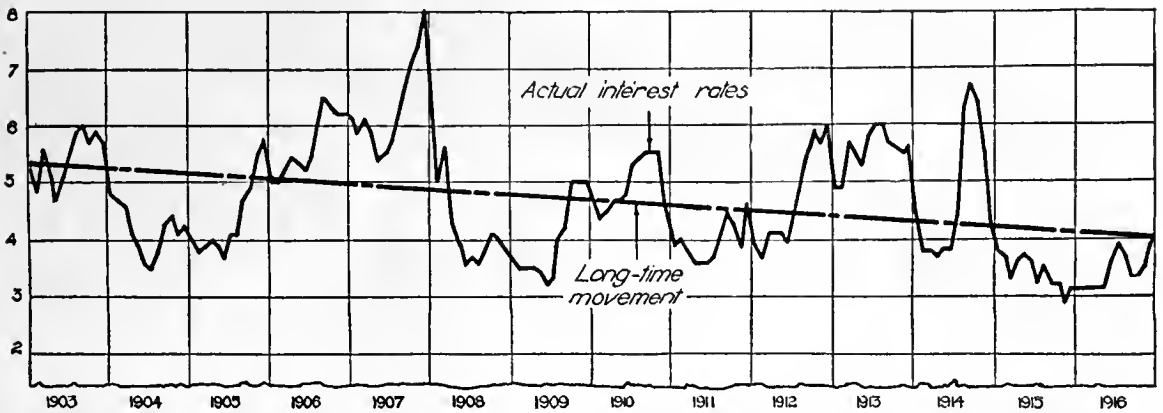


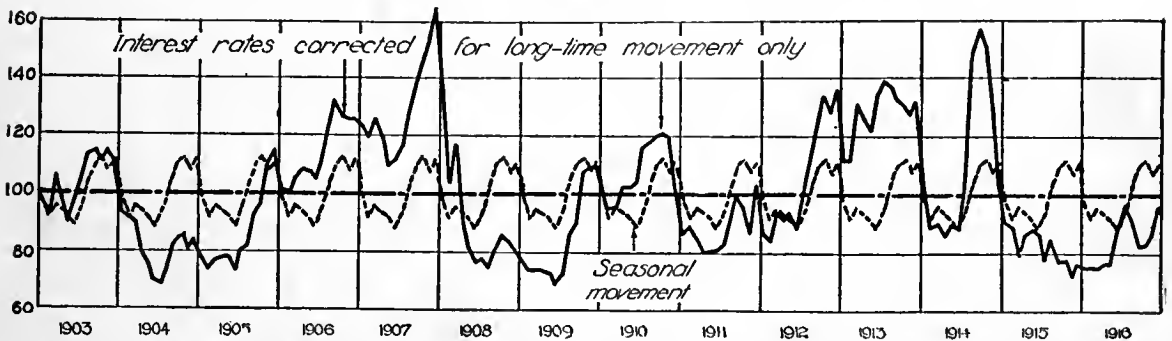
CHART IV. — INTEREST RATES: ACTUAL FIGURES
(Unit: one per cent per annum.)



EXPLANATION: The above chart shows the actual rates on choice double-name 60-90 day commercial paper by months for the years 1903-16. During this period there was a gradual downward trend of discount rates, as shown by the straight line fitted to the original items. Correction for this influence

was accomplished, as in the case of pig iron, by expressing the actual rate for any month as a percentage of the corresponding "normal" rate indicated by the straight line. The resulting figures appear in Chart V below

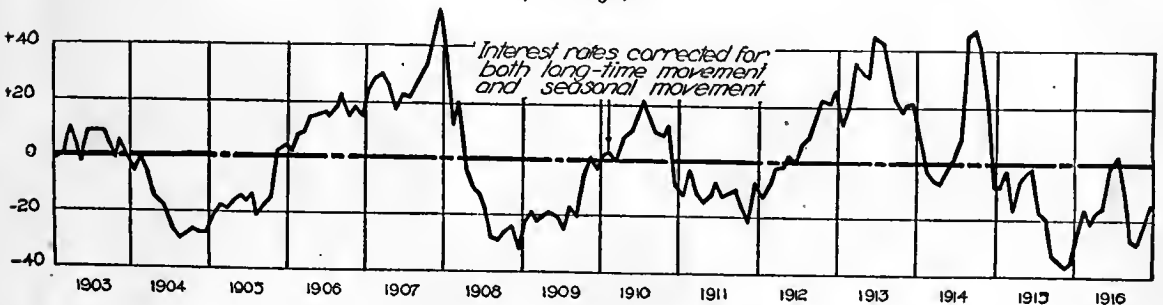
CHART V. — INTEREST RATES: FIGURES CORRECTED FOR LONG-TIME MOVEMENT
(Percentages)



EXPLANATION: The solid line on the above chart represents the rates on 60-90 day commercial paper corrected for the long-time movement, but not for the seasonal movement; the dotted line indicates the seasonal variation in rates through the year. This variation, it is clear, is relatively greater than that of pig-iron production (Chart II). Correction for the seasonal influence was made by taking the difference between the corresponding items of these

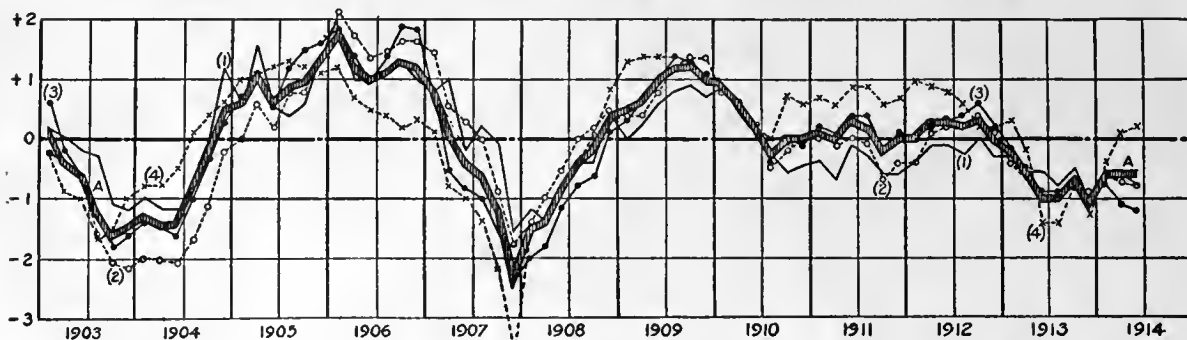
two lines. The results of this subtraction show in each case by how much the actual rate, after the long-time movement had been eliminated, exceeds or falls short of the rate normally to be expected for that month of the year. These differences (presented in Chart VI below) are called "the corrected figures," since both the long time and seasonal movements have been removed from them.

CHART VI. — INTEREST RATES: CORRECTED FIGURES
(Percentages)



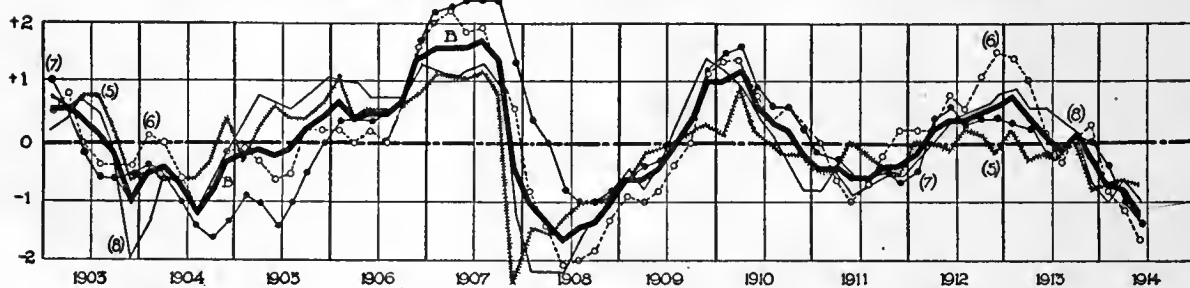
6 INTERPRETATION OF THE INDEX OF GENERAL BUSINESS CONDITIONS

CHART VII. — CORRECTED FIGURES FOR THE SERIES OF THE SPECULATIVE GROUP (A), 1903-14



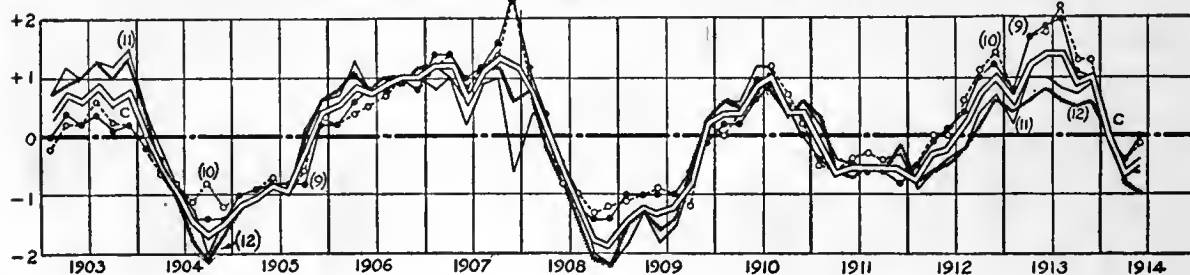
- (A) Group average. (1) Bank clearings of New York City (2) Average price of industrial stocks. (3) Average price of railroad stocks. (4) Average price of railroad bonds.

CHART VIII. — CORRECTED FIGURES FOR THE SERIES OF THE BUSINESS GROUP (B), 1903-14



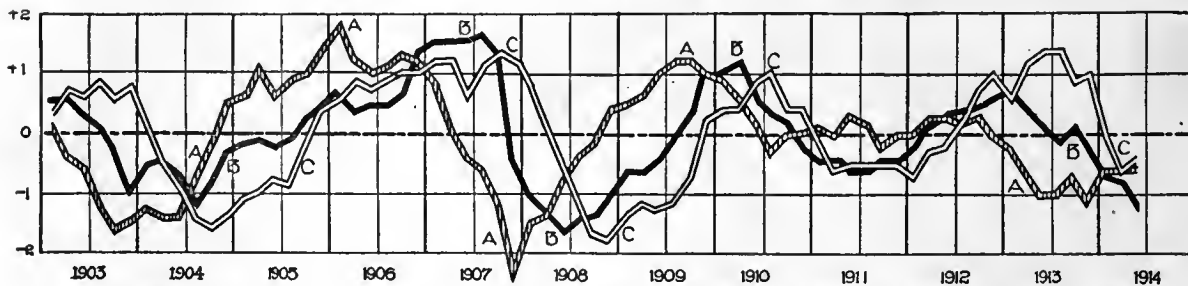
- (B) Group average. (5) Bank clearings of the United States outside New York City. (6) Bradstreet's index of wholesale commodity prices. (7) United States Bureau of Labor Statistics' index of wholesale commodity prices. (8) Pig-iron production.

CHART IX. — CORRECTED FIGURES OF THE SERIES OF THE BANKING GROUP (C), 1903-14



- (C) Group average. (9) Interest rate on 60-90 day commercial paper in New York City. (10) Interest rate on 4-6 months commercial paper in New York City. (11) Loans of New York City Clearing House banks (reversed). (12) Deposits of New York City Clearing House banks (reversed).

CHART X. — THE INDEX OF GENERAL BUSINESS CONDITIONS, 1903-14



- Group averages for: (A) Speculation: prices of securities and volume of stock sales. (B) Business: wholesale prices of commodities and volume of business. (C) Banking: Commercial paper rates and bank loans and deposits.

Statistical series, thus corrected and thus sorted, reflect accurately the cycles of speculation, business and banking, and constitute the data used in our Index of General Business Conditions.

The purpose of the Index of General Business Conditions published by the Harvard Economic Service is to provide, first, a record of business cycles, and second, a basis for forecasting business conditions. A full explanation of the data and technical methods used in constructing it is given in *Indices of General Business Conditions*.¹ The explanation which follows is intended to serve as a guide in interpreting the current index.

II. THE INDEX CHARTS, 1903-14 AND 1918-22

The precise method of constructing our Index will be understood by referring to the charts on pages 4, 5 and 6.

Charts I and IV present the actual figures for two series chosen for illustration — pig-iron production and interest rates. On the same charts appear two straight lines which represent the long-time movements of those series.

Charts II and V present the figures of the two series corrected for the long-time movements only. The usual seasonal movement of each series is shown by the broken line.

Charts III and VI present the figures corrected for both long-time movements and seasonal influences. It is evident that the figures, thus corrected, reveal the cyclical fluctuations more clearly than do the crude data.

Charts VII to IX present the corrected figures for the two series chosen for illustration, and ten others. It will be seen that the twelve series are sorted into three groups — group A, being given in Chart VII, group B in Chart VIII, and group C in Chart IX — according to the times at which maximum and minimum points of the series occur. Group A, consisting of series which fluctuate first, either upward or downward, are all series depending upon speculation; group B, consisting of series in which the fluctuations follow or lag behind, in point of time, the fluctuations of the speculative group, all have to do

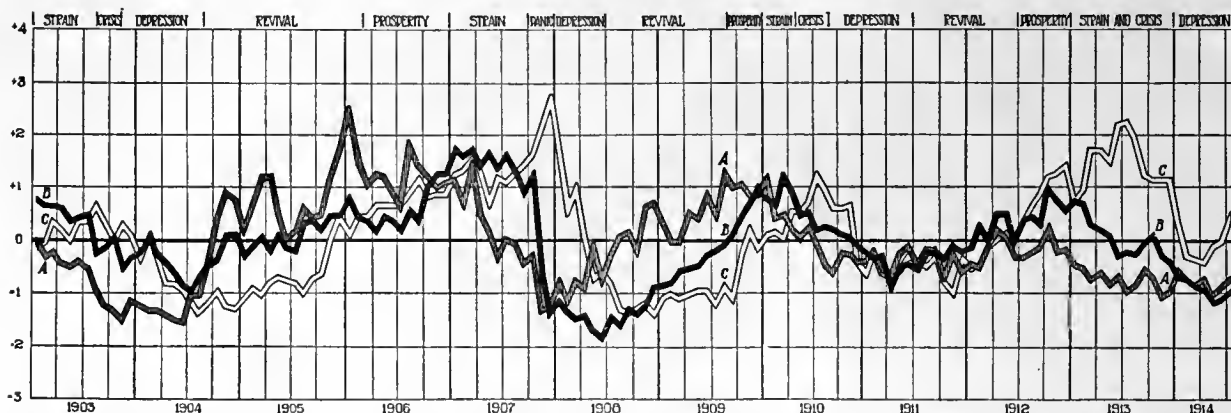
with business and industrial activity; group C, consisting of series whose fluctuations lag behind those of the business group, all have to do with banking conditions and the money market. The average of each group of series was then found, with the result that we obtained an average representing speculation, an average representing business, and an average representing banking, during the period covered by the charts. In Chart X curves are shown representing these three averages, and in this manner an Index of General Business Conditions was obtained for the period 1903-14. The relationships which obtained between the three curves representing speculation, business and banking, during the pre-war period, are evident from the chart, the most significant for the purposes of forecasting being the order in time of the major movements. These relationships are the basis for our interpretation of the current Index Chart, which shows the conditions that have existed since the armistice.

For the period 1914-18 the Great War and government control of industry dislocated economic conditions to such an extent that the normal relations between speculation, business, and banking, which the Index shows to have obtained in time of peace, no longer existed; the chart for the war period is, therefore, not presented. The current Index, however, for the period since the armistice — based necessarily on somewhat different statistical series from those originally utilized for the pre-war period — shows that the normal pre-war sequences between speculation, business, and banking have been resumed. Forecasts of business conditions may, therefore, safely be made from the current Index of General Business Conditions, on the basis of conclusions drawn from pre-war relationships.

When the task of constructing the Index for the period 1918-22 was undertaken it was found that current figures for the statistical series utilized for the pre-war period were not all available and suitable. Consequently, as has been said, the current Index is based upon somewhat different data from those originally utilized for the period 1903-14. In order to demonstrate graphically the essential similarity of the data underlying the current Index Chart and that for 1903-14, we have reconstructed the chart for the earlier period using the identical series which

¹ Published in book form by the Harvard Economic Service; reprinted from *THE REVIEW OF ECONOMIC STATISTICS*, January and April, 1919.

CHART XI. — THE INDEX OF GENERAL BUSINESS CONDITIONS, 1903-14

(A) *Speculation* (B) *Business* (C) *Money*

EXPLANATION: This chart is based upon precisely the same statistical series as those used in the current Index, given on the opposite page. The curves are not so smooth as those of Chart X because, first, a smaller number of

series was averaged in each group and, second, the items are monthly instead of bimonthly.

enter the current chart. The indices thus secured are given in Chart XI. The curves of this chart show minor fluctuations which the earlier chart did not — due to use of monthly data instead of bi-monthly and fewer series — but the outstanding movements are the same.

In both the pre-war and post-war periods the major movements of curve A, speculation, preceded and hence forecast the movements of curve B, representing business. Likewise, the major movements of curve B preceded and, in turn, forecast those of curve C, representing money.

The Index Chart shows clearly five recurrent phases in the business cycle, each phase occurring three times in the period from 1903 to 1914. The five phases are: (1) depression, (2) revival, (3) business prosperity, (4) financial strain and liquidation of securities, and (5) industrial crisis and liquidation of commodities. Each phase develops gradually into the one following, but each, nevertheless, is distinguished by characteristic movements of speculation, of business, and of money. The Index Chart, through the movements of the three curves, reveals the phase of the business cycles existing at any time and, properly interpreted, forecasts the phase in prospect.

III. INTERPRETATION OF THE INDEX

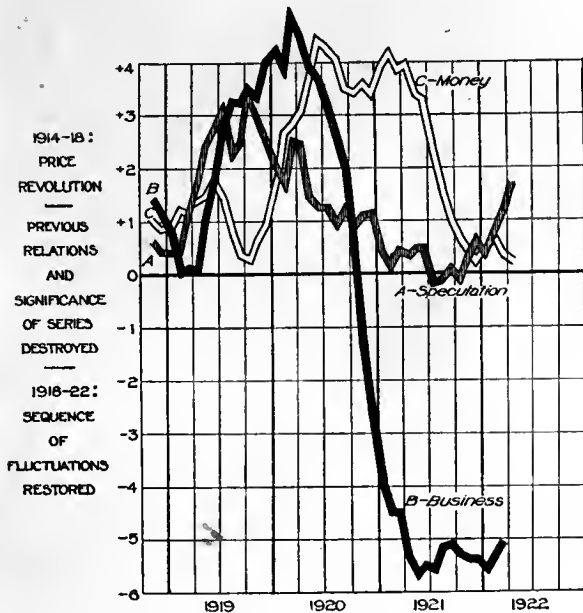
Various generalizations have been made by students of business fluctuations as to the length

and regularity of the interval between economic crises or between business depressions. The generalization which has received the widest currency is that crises occur at 10-year intervals. The proponents of the 10-year theory cite, in support of their case, the crises of 1837, 1847, 1857, and, after the Civil War in the United States, those of 1873, 1884, 1893, and 1903. Another generalization is that crises, especially those of the last 25 or 30 years, have occurred regularly at 7-year intervals; thus, it is pointed out, crises came in Europe in 1893, 1900, 1907, 1914, and 1921. It will be observed that, comparing the dates given in support of these two theories, there is obviously a conflict in the evidence offered. Although it is clear that there *are* business cycles with recurrent phases of prosperity and depression, it has not been proved that such cycles are of uniform duration.

One of the most striking and significant things brought out by our Index Chart for 1903-14 is the relatively short interval from prosperity to prosperity, or depression to depression. Basing our calculations on curve B, representing business, we find an interval of somewhat less than four years from the trough of the depression of 1904 to the trough of the succeeding depression of 1908, and intervals between the depressions of 1908, 1911, and 1914 of about three years each.

Evidence concerning the frequency of business depressions, consistent with that of the Index

CHART XII. — THE CURRENT INDEX, 1918-22



Chart, is offered by the course of commodity prices and interest rates since 1890, shown in the chart on pages 2 and 3. The intervals between successive troughs of the wave in the curve for commodity prices from 1892 to 1914 are, in months: 34, 26, 44, 44, 43, 43, and 36. The intervals between the troughs in interest rates are harder to determine, because of the substantial seasonal influence, but the chart shows that periods of cheap money occurred in 1892, 1894-95, 1898, 1900-01, 1904, 1908-09, 1911, and 1914-15. The evidence of both of these important statistical series, and that of the Index Chart, supports the conclusion that for the twenty-five years preceding the war, periods of business depression occurred at intervals of approximately 3 or 4 years, with one interval as short as 26 months.¹ In other words, business cycles are of comparatively short duration. Further, the lengths of complete cycles in the past, 26 to 44 months, have not been uniform enough to warrant predicting the time at which a given phase of the business cycle will develop, *if that prediction must be based upon the assumption of a constant interval between crises, or between periods of*

¹ In the post-armistice period it happens that the interval, shown by curve B of our Index Chart, between the trough of the short-lived depression of 1919 and the depression of 1921 (February 1919-May 1921) is 28 months.

depression. The established sequences of movements of speculation, business and money, however, afford a method of solving this problem.

The forecasts of the Harvard Economic Service are not based upon the assumption that the complete business cycle is of invariable length. Nor are they based upon the distances from the base line of the three curves of the Index Chart, representing speculation, business, and money. Rather, the forecasts are based upon the relations which exist among those curves during any given phase of the business cycle and the magnitude of the movement from crest to trough of each curve.

In interpreting the Index Chart the points of primary significance to consider are:

- First, the direction of movement of each curve considered in connection with the direction of movement of the other curves;
- Second, the direction of the immediately preceding movements; and
- Third, the magnitude of such movements.

These are the primary points to consider in forecasting because they indicate the phase of the business cycle which is immediately in prospect.

As an illustration of the method of interpreting the Index Chart let us consider the situation which it revealed in the second half of 1921. Curve A, representing speculation, was moving upward from the low point of July. This upward movement was significant for three reasons. First, it was a reversal in direction after the long-continued decline which had been in progress since November 1919. Second, it was accompanied by a sharp decline in curve C, representing money rates. Third, the business curve, though moving somewhat irregularly, showed that the volume of business and commodity prices had ceased the drastic decline which had been in progress from April 1920 to May 1921. The forecasts to be drawn from this combination of circumstances were, first, that the upward movement of speculation, being accompanied by declining money rates, was the beginning of a substantial and persistent rise, and second, that the rise in speculation would be followed after an interval, by a substantial improvement in business, represented by curve B.

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It was possible to forecast the approximate time at which the "substantial improvement in business" might be expected by means of the relationship between curves C and B, representing money and business, respectively. The relationship of the curves of our Index Chart in the second half of 1921 was closely similar to that in the summer of 1904, in the spring of 1908, and in the winter of 1910-11. The improvement in business following these dates took place ten to twelve months after the beginning of a marked decline in interest rates. Such a decline was the most noteworthy development of the last eight months of 1921. It was not until May of that year that the decline in interest rates, and hence in curve C, reached large and, hence, significant proportions. The highest rate had been reached in October 1920, when 60-90 day paper was quoted at 8 per cent. In the months following the rate fell slowly until a figure of $7\frac{1}{2}$ - $7\frac{3}{4}$ per cent was reached in the middle of April. Thereafter the decline was very rapid, and at the end of the year the prevailing rate was 5 per cent. In previous business cycles — 1904, 1908, and 1910-11 — a sharp decline in curve C began, as has been said, some ten to twelve months previous to a substantial rise in curve B. On the basis of the experience of former business cycles, therefore, a substantial improvement in business activity and commodity was forecast to begin ten to twelve months after April 1921, or from February to April 1922. It will be noticed that the forecast of the probable time of substantial improvement of business was based, not on the assumption that the duration of the business cycle is three years or any other fixed period, but upon the time relationship existing among the curves of the Index Chart.

Not only do the speculative and money curves of the Index Chart forecast general business conditions, but the movements of the money curve forecast major movements in speculation. Thus, during the period 1903-14 the culmination of an upward movement and the beginning of a downward movement of speculation, curve A, were invariably signaled by a sharp advance of money rates, curve C; previous to such a signal rates had remained low in each instance — 1904-05, 1908-09, and 1911 — for about a year. A sharp rise in curve C, resulting from an increase in *actual* rates on commercial paper of about $1\frac{1}{2}$

per cent during a period of six months or less, occurred in September-December 1905, August-November 1909, and March-October 1912. During the pre-war period, therefore, each rise preceded and hence gave warning of pronounced liquidation in security markets.

In 1919 the federal reserve system was in operation and rediscount rates were kept low in response to United States Treasury requirements. For this reason rates on commercial paper did not reflect money market conditions previous to November 1919, when rediscount rates were first increased. Our current Index Chart shows that, contrary to precedents of the pre-war period, a sharp rise in money rates did not precede the inauguration of the bear market of 1919-20. It will be noticed, however, that such a rise took place *concurrently* with the decline in speculation, curve A.

Long continued and substantial advances in speculation, both in the pre-war and post-war periods, were signaled by a sharp decline in money rates followed by about a year of easy money. In one instance, 1911-12, however, during the period covered, the advance in speculation was relatively small.

IV. SUPPLEMENTARY DATA

Although it is possible by proper interpretation of the Index of General Business Conditions alone to judge the existing business situation and forecast probable developments, that Index does not present a complete, detailed picture of finance, trade, and industry. Thus, curve B of the Index Chart, representing business, is based upon statistical series which reflect commodity prices and the monetary volume of business. In order to supplement the Index of General Business Conditions another index has been computed which is based upon the physical quantities of goods manufactured.

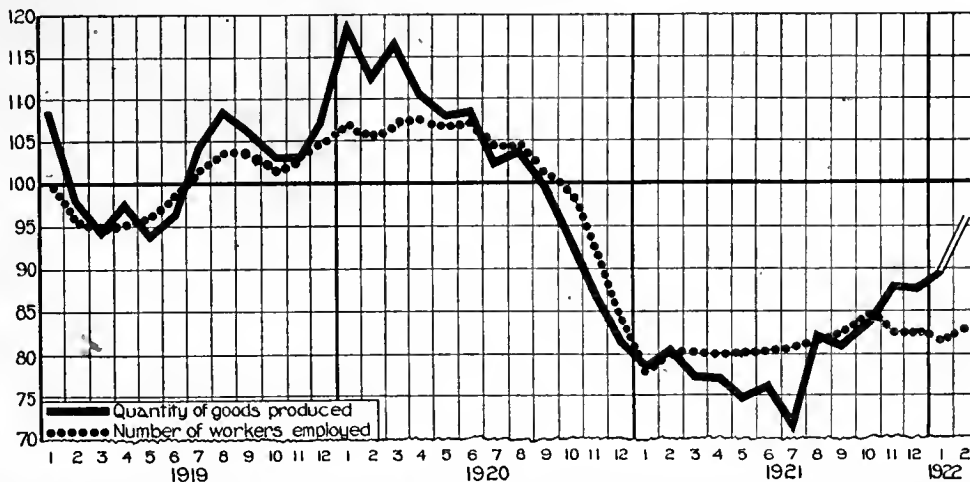
The Index of the Volume of Manufacture, given in Chart XIII, shows the fluctuations in the quantity of goods produced by seven leading groups of manufacturing industries — iron and steel, lumber, paper, textiles, leather, food, and tobacco — monthly since January 1919. Adequate data for the construction of a similar index for the pre-war period are not available.

This Index registers definitely the cycle

through which manufacturing activity has recently passed in the United States. It discloses that a continuous and rapid decline in output began in April 1920, when curve B of Chart XII also inaugurated a similar decline.

In addition to the data bearing upon the volume of manufacture other data are presented in the Harvard Economic Service which throw light upon, and hence aid in interpreting, the movements of the three curves of the Index

CHART XIII.— ADJUSTED INDEX OF THE VOLUME OF MANUFACTURE
(Normal = 100)



EXPLANATION: The index of the quantity of goods produced is based upon the physical output of seven large industrial groups—iron and steel, lumber, paper and printing, textiles, leather, food, and tobacco—and the index of employment is based upon the number of workers on the pay rolls of seven industrial groups—manufacturing machinery and conveyances, automobiles, railroad cars, wood products, printing and paper goods, clothing and millinery, and boots and shoes. In constructing this index, both long-time tendencies and seasonal variations have been carefully estimated and

eliminated so that the fluctuations of production and employment, reflected by the movements of the two curves recorded on the above chart, are free, first, from seasonal influences to which practically all lines of business are subject and second, from the long-time movement which is usually the result of an increasing population and industrial development. Each figure is adjusted for seasonal influence and expressed as a percentage of normal. "Normal" is statistically determined on the basis of experience, good and bad years, and long-time tendencies being considered.

The rate of decline in output greatly lessened after the end of the year, but a slow irregular decline continued so that the minimum was reached in July 1921. Since that month the recovery has been substantial.

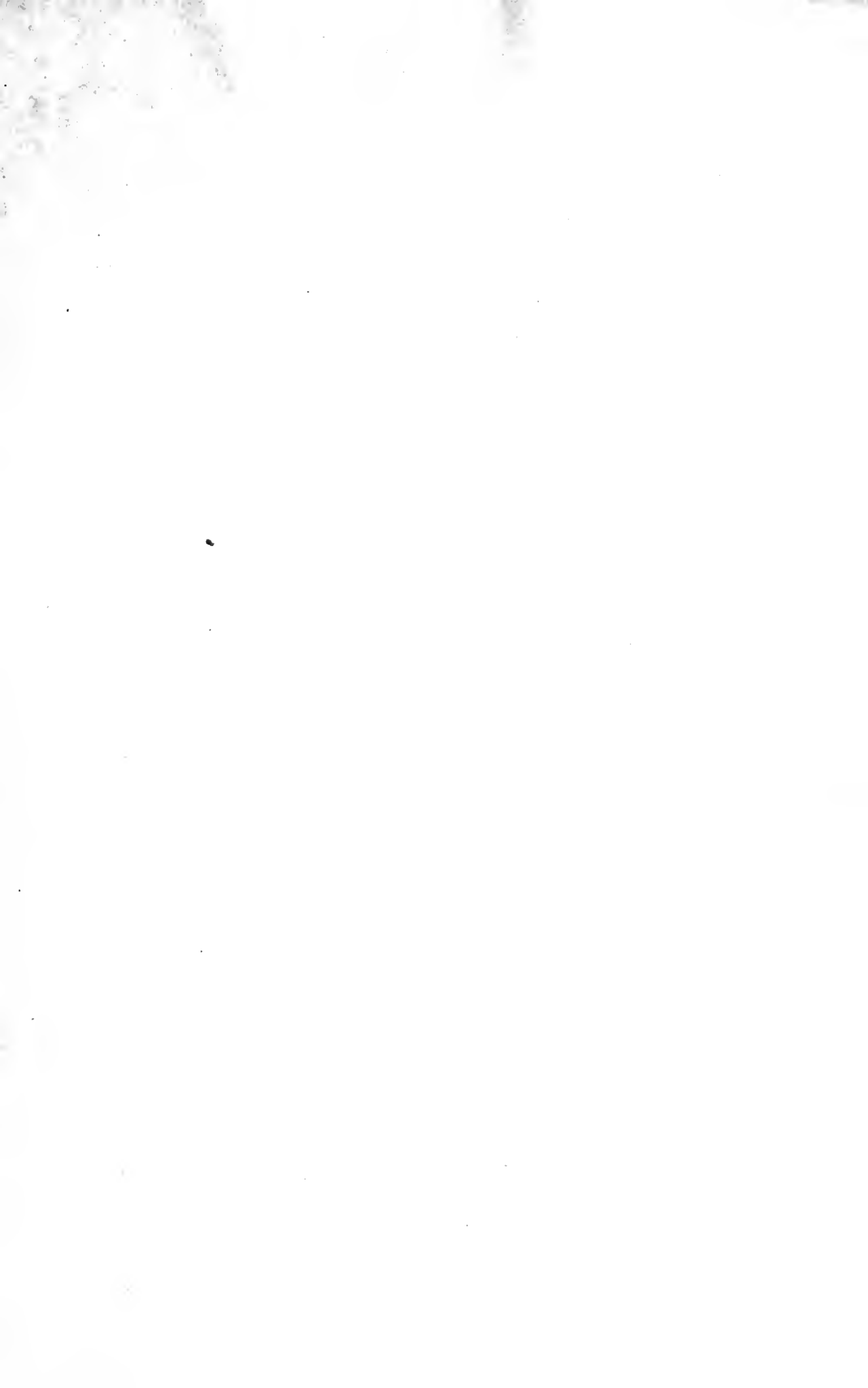
The relative movements since the middle of 1921 of the Index of the Volume of Manufacture and curve B of the Index Chart are significant. While manufacturing output rose substantially curve B, dependent upon prices, registered a comparatively moderate upward trend during the same period. In the recent business depression, therefore, a substantial increase in the physical volume of manufacture preceded, and probably forecast, an increase in commodity prices.

Chart. Such data include: indices of industrial employment; prices of leading commodities, their purchasing power, and their interrelations; indices of prices of various classes of securities; the value and quantity of foreign trade; the international balance of payments; the production and prices of agricultural products; the volume of security issues; and financial and economic statistics of leading European countries. We shall also add to these features an Index of British Economic Conditions, which has been constructed by distinguished English statisticians along lines similar to those followed in the construction of our own Index.

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