Volume Title: Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856

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# CHAPTER VII

# FACTUAL LEADS AND LAGS AND EMPIRICAL FORECASTING

THE movements of the various individual series from 1856 to the present, and the similarities and dissimilarities of those movements are graphically presented in the charts scattered through this volume. The figures there depicted are presented in Appendix A. Better than in any mere text the reader will find in the tables, and especially in the charts, a clear picture of what has happened to short term interest rates, bond yields, stock and commodity prices and physical and monetary trade volumes in the United States during the last seventy-nine years.

The different trends are collected and presented in Chart 29. An examination of it and of the various charts on which data and trend curves appear together shows that the trends differ noticeably with respect not only to the rates of advance or decline but also to the possibility of their being adequately described by a mathematical equation representing a curve of clean-cut sweep.

Pig iron production and deflated bank clearings outside New York City suggest that their long movements could be represented by 'growth' curves of some kind or other;[1] railroad stock prices give a much less definite mathematical suggestion. The periods during which the line joining the data points does not intersect the trend line are much longer and the arrangement of its deviations around the trend line is much more irregular. Finally, in the collapse that began in 1929 those prices acted in such a manner as to suggest that they may never again even touch the old trend line. The trends of short term interest

[1] The mathematical equation used to describe the trend of pig iron production was fitted to the data fifteen or sixteen years ago. Upon taking up the series for the purposes of this book, we decided to use the curve already fitted, not only because it had remained so astonishingly good but also because of the interest attaching to it as an illustration of how growth curves seem sometimes to be more than mere fits to existing data.

rates, bond yields, and commodity prices are still less suggestive of any 'growth' or other simple mathematical curve. The trend lines were obtained by 'smoothing' and not by 'fitting', and the appearance of both the smoothings and the raw data suggests strongly that this was the only defensible procedure.

Chart 29 is presented to show the relations between the long term or 'trend' movements of the various series. It is composed of the various 'trend' graduations. The first thing that will strike the reader is, as we have said, that these lines do not appear to be true 'trends' at all. They do not have the single, simple sweep of such trend curves as are represented by the mathematical equations fitted to deflated bank clearings outside New York or to pig iron production. Each line, even those representing the deflated bank clearings and the pig iron series, shows more or less pronounced long term sinusoidal or wavelike movements. This is accounted for by the fact that, while the 'trend' graduation that we have used eliminates all the so-called ordinary 'business cycle'—ranging in length up to about four or four and a half years—it does not eliminate all the longer waves that appear in the data. The difficulty encountered in any such procedure as we have engaged in is to obtain a 'trend' line that will, as far as possible, show each 'cycle' as working definitely back and forth across such a line and, at the same time, eliminate as long cycles as possible. We may have erred in not choosing a formula that would have more of a dampening effect on the longer cycles—though such a formula has its own disadvantages. However, since we present the whole story not only graphically but also by means of tables, the reader may form his own opinion whether, in any particular instance, our conclusions might have been somewhat different if we had used a different 'trend' graduation. Call money, time money and commercial paper show the most pronounced of these long term wave movements—long term 'cycles' we might call them, if we did not wish to save that word for somewhat shorter movements. The amplitude of the long term wave movements becomes less as we pass from call money to rates on loans of longer duration, time money and commercial paper. In the bond yields line they almost disappear. That line is more like a typical 'trend'. The opposite movement in the trend lines for railroad stock prices and bank clearings in New York City from 1914 to about 1919 is rather striking, if we consider how closely the two curves move together in other periods. The history of the railroads in that period was, of course, exceptional—as the chart indicates.

On examining Chart 21 the reader will notice that the 'cyclical' movements of the series have as marked peculiarities as their trends. The first difficulty he will encounter, although he is examining smooth curves and not raw data, is to decide what he should call a 'cycle'. He will soon see that it is not sufficient to define a cycle merely as a portion of the curve that lies between two maxima (or minima). Not only will he note that maxima and minima may appear in a curve representing deviations from a trend when they do not appear in the original data but also he will begin to feel that the end points of a cycle are not necessarily either maxima or minima. In some instances the suggestion will be strong that, even though there be no maximum or minimum point, there is an end point that lies between two points of inflection. A point at which the second derivative is a maximum or minimum (the third derivative zero) often lies on a date that it would seem reasonable to take as a dividing line between two 'cycles'. Not only the appearance of the preceding and succeeding portions of the smooth curve itself but also the relation of the date to the dates of maxima or minima in other series may tend to confirm such a decision.

However, the reader dare not allow any such mathematical considerations to outweigh his calm judgment concerning the type of 'cycle' he is interested in, or he may find himself with several 'cycles' each covering less than a twelve-month period. He must reject very short period cycles of negligible amplitude, especially if they occur between two points that are neither maxima nor minima even though their third derivatives equal zero. But he will find it very difficult, if not impossible, to formulate mathematical rules to guide him in the process of elimination.

The second difficulty he will encounter is closely related to the first. Even in the same series all 'cycles' are not equally clear cut, and even when equally clear cut, they are not equally important. The variation in amplitude between a cycle of pig iron production covering a period of world-wide industrial collapse and one that is revealed only through mathematical analysis may for most purposes be considered a difference in kind rather than merely in degree.

Finally, struggle as the observer may to decide what are the cycles in his various series, he will find that some series undoubtedly have a larger number of definitely defined cycles than others. This is, of course, not surprising, though seldom recognized. Everyone knows that some economic series show pronounced seasonal cycles that are totally or almost totally lacking in others. And this brings up the subject of the attempts that have been made to discover mathematically regular 'business cycles'.

Virtually all 'cycle theorists' unconsciously assume that it is possible to discover the dates on which 'cycles' begin and end and also that, in any particular period, there are the same number of cycles for each important economic series.

Nearly all the earlier and cruder efforts contained the further implicit assumption that there were no 'interferences' in the 'cyclical' movements. At any one time there was only one cycle. The picture was always that of a huge ground swell on a glassy sea rather than the choppy waves where two currents meet, or even the ordinary picture of small waves superimposed on larger ones.

The possibility that the amplitude of the cycles might vary was not discussed or even considered. Periodicity was the only concern of the writers. A ten-year cycle was a ten-year cycle if ten years intervened between two 'crises'. It mattered not whether, during the intervening years, there had occurred a boom that would go down in history, like the Mississippi Bubble, or merely such a negligible degree of prosperity that it was difficult to say when the terminating crisis began.

The proponents of rigid mathematical cycles early tended to base them on, or at least relate them to, astronomical periodicities. Two great astronomical cycles had been recognized before the dawn of history, indeed before the advent of man. The lives of even the lower animals were subject to the domination of day and night and the sequence of the seasons. It was almost inevitable that with the discovery of the 'sunspot' cycle, this longer solar cycle would soon be used by the economists. Its relation to terrestrial magnetism began to be investigated early in the nineteenth century; by the third quarter of that century 'sunspottery' was breaking out in economic circles. It was a period in which the cyclic idea was budding everywhere. The files of the English periodical *Nature* are full of suggestions; 7-day, 30-day weather cycles, 4-year, 8-year, 10-year, 16½-year, 19-year, 21-year, 33-year, 35-year, and 400-year weather cycles were all to appear.

About 1862 Professor W. Stanley Jevons came to the conclusion that the dates of the preceding five English economic disturbances (1815, 1825, 1836–39, 1847 and 1857), which averaged 10.5 years apart and in each instance were extremely close to this normal interval, contained the clue to some mathematically exact nature cycle. His first attempts to correlate these figures with sunspot maxima and minima were disturbed by the fact that the sunspot cycle was at that time held to be about 11 years and not 10.5. When, however, Mr. J. A. Broun in 1877 came out with the statement that the true mean interval was 10.45 and not 11.1, Jevons' fate was sealed.[2] He seized upon Broun's 10.45 figure with highly unscientific avidity and from that time (1877) became almost unbalanced in the ardor with which he fitted facts to his theory.

A couple of years previous, in 1875, he had examined and discussed the data in Thorold Rogers' *History of Agriculture and Prices in England since 1259.* He then believed, he tells us somewhat naively, that "he had discovered the solar period in the prices of corn and various agricultural commodities", and he accordingly read a paper to that effect at the British Association in Bristol. "Subsequent inquiry, however, seemed to show that periods of 3, 5, 7, 9 or even 13 years, would agree with Professor Thorold Rogers' data just as well as a period of eleven years," to quote Jevons' own words, and in disgust at this result he withdrew the paper from further publication.

J. A. Broun's 10.45 mean interval, however, prevented any such continued discouragement with the theory, as we witness in 1875. By November 1878 we have an article by Jevons in *Nature* (November 14, 1878, pp. 33–7) on Commercial Crises and Sun-spots, another article early in 1879 on the same subject, and in February 1879 we have a serious attempt at correlating *Sun-spots and Plague* which exhibits almost pitiably the extent to which Jevons was then outraging his own great intelligence.

An interesting feature of his article on *Sun-spots and Plague* is that Jevons suggests the correlation of plague and Asiatic famine. In view of this suggested correlation it is of some significance to note that in this article the incidence of plague (and hence of Asiatic famine) is

[2] 11.1 is closer to the modern figure than is 10.45.

supposed to coincide with sunspot *maxima,* whereas in his later articles on sunspots and commercial crises, commercial crises are synchronized with sunspot *minima* and at the same time with Asiatic famine.

In general, Jevons compared imagined or real crises not with sunspot maxima or minima but with dates, when, under Broun's discredited average, sunspot maxima or minima *should* have occurred—but did not—and this in the face of the fact that he had access to the data of actual observations tabulated by Wolf. Taking Jevons' own list of crises in order and comparing them with the closely-known epochs of maximum and minimum sunspot frequency, we obtain the following results: The doubtful (we should say 'assumed') crisis of 1701 followed a spot minimum by three years and preceded a maximum by four and one-half; the crisis of 1711 (predicated by Jevons merely because the South Sea Company had been *founded* in that year) followed a minimum by five and one-half years and preceded a maximum by one year; the South Sea Bubble of 1720 (Jevons places the date at 1721) followed a maximum by one and one-half years and preceded a minimum by three and one-half; the imagined crisis of 1731–32 preceded a minimum by two years; 1742 (no crisis known) preceded a minimum by three years (the joker here is that *1745* was a year of both minimum sunspots and panic—December 6, 1745, when there was a run upon the Bank of England due to fear engendered by the progress of the army of the Young Pretender—but Jevons refuses to notice this because he refused to accept Wolf's sunspot figures, seemingly because they did not check with his preconceived ideas); 1752 (no crisis) followed a maximum by two years and preceded a minimum by three; 1763 came *exactly* half way between a maximum and a minimum; 1772 came two and one-half years after a maximum and three and one-half years before a minimum; 1783 preceded a maximum by two years; 1793 came just half way between a maximum and a minimum; 1804–05 (no known crisis) coincided with a *maximum* (not a minimum); 1815 preceded a maximum by one and one-half years; 1836–39 included the year 1837 of *maximum* solar activity, that being also a year of panic in the United States); 1857 followed a minimum by one year; 1866 preceded a minimum by one year; 1878 was a minimum sunspot year. The dates of later crises reveal similar lack of agreement with the sunspot cycle.

The nadir of sunspottery was soon reached. In an article in the

May 1872 issue of *Nature* we find a certain B. C. Jenkins stating that "cholera epidemics have a period equal to a *period and a half* of sun-spots"! Henry Jeula in 1877 made a careful and laborious attempt to correlate sunspots and the number of wrecks posted each year in Lloyd's loss book—(based upon the assumed correlation of sunspots and East Indian hurricanes). By March 1879 he came to his senses, however, and in the *Journal of the London Statistical Society* of that date we have an oasis in the desert of nonsense that was being written by unscientific 'country gentlemen'. He made a most brilliant success of correlating Oxford-Cambridge boat races and sunspot maxima and minima. To quote from his article: "A cycle is believed to consist, as nearly as can at present be ascertained, of about eleven years, of which the 1st, 2d, 10th, and 11th form the minimum sun-spot group, the 3d, 4th, 8th, and 9th the intermediate groups; and the 5th, 6th and 7th the maximum group. Of 12 races rowed in the minimum group, Oxford won 66 per cent; of 10 races rowed in the maximum group, Cambridge won 60 per cent; while of 16 races rowed in the intermediate sun-spot group of years, each university won exactly half."

Modern cycle theory has availed itself of the mathematical apparatus of harmonic analysis. The flexibility of a Fourier series is as great as that of a power curve or higher parabola but, unless the essential nature of the data is periodic as is the case with such physical phenomena as heat, light, sound and electricity, the resulting mathematical descriptions or 'fits' are purely empirical. It is extremely easy to describe almost any time series by means of a set of superimposed sine curves of different periods and amplitudes but it is quite another matter to be able to describe data (whether future or not) that were not used in obtaining the constants. What shall we say of a mathematical 'law' that by its nature can be used to describe only those observations from which it was itself derived?

The mathematically exact economic cycles presented—before the onset of the depression of the 1930's—by some modern economists and accepted by many modern business men merit little if any more favorable consideration than we have given to the pronunciamentos of Jevons. We intend to save space and preserve friends by not discussing them. In the charts of this book the reader has before him abundant material to come to a conclusion about any of them—if he does not do what Jevons and so many of his modern representatives tend to do, call a rain storm a flood if by so doing it will seem easier to float a theory.

While but few economists believe that business prosperity comes and goes like day and night, or even rises and falls with the regularity of the tides—complicated as are the mathematics involved in lunar theory—there are probably even fewer who believe that either prosperity or depression is an accident that befalls the body politic. Dr. Mitchell's theory that the essence of 'business cycles' is to be found in the fact that the conditions attendant on each phase of the 'cycle' tend to bring on, sooner or later, the next phase has become almost universally accepted. That theory is sharply separated from the mathematically exact cycle theories by its emphasis on the indefiniteness of the timing, and from the accident theories by its emphasis on internal causation.

And this internal causation tends to show itself in leads and lags among important economic series. But the reader must not expect always to find a high degree of regularity in the relations among the various series or he will be badly disappointed. The uniformity is often rather specious. It sometimes amounts almost to an optical illusion. The general rule is that there is no rule. In all cases (aside from such essentially similar data as the various short term money series) irregularity is an outstanding characteristic. Often it is *the* outstanding characteristic. While a cursory examination of such a chart as number 21 might give the impression of extreme regularity in the sequences of and relations among the various series, more careful study will disclose a high degree of irregularity. For example, if the series should be thought of as having typical time lags, it is extremely difficult to say what they are. Sometimes a maximum or minimum sweeps across the chart in a startling manner, the various lags being clear cut and unmistakable. On the other hand, the entire picture is often quite obscure. Arithmetic averages of the amounts of lag are very treacherous. The inclusion of a single doubtful case may appreciably affect the result. Medians might be thought to be more suitable than arithmetic averages in such a case, but the essential feature of the data is that any type of average will involve making some questionable decisions. Moreover, the 'scatter' around the average—the 'deviations' from the average or typical lag—are extremely large in all

CHART 20

# AMERICAN RAILROAD BOND YIELDS AND SHORT TIME INTEREST RATES IN NEW YORK CITY

THE SHORT TIME RATES ARE ADJUSTED FOR SEASONAL FLUCTUATIONS, THE BOND YIELD DEVIATIONS ARE NOT. THE LOGARITHMIC SCALES FOR THE SHORT TIME RATES AND FOR THEIR SEASONALS ARE IDENTICAL. THE BOND YIELD DEVIATIONS LOGARITHMIC SCALE IS TEN TIMES AS GREAT.

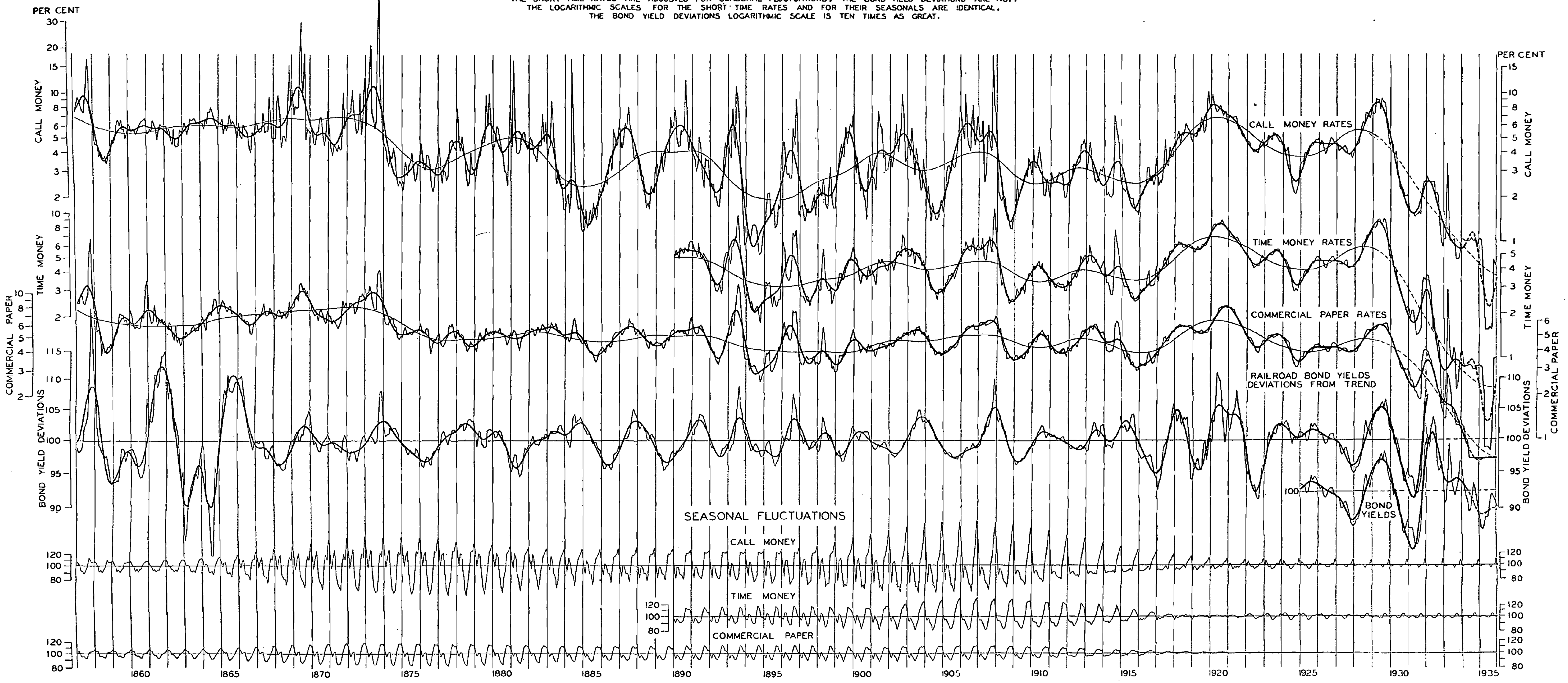

CHART 20
AMERICAN RAILROAD BOND YIELDS AND SHORT-TIME INTEREST RATES IN NEW YORK CITY

THE SHORT TIME RATES ARE ADJUSTED FOR SEASONAL FLUCTUATIONS, THE BOND YIELD DEVIATIONS ARE NOT. THE LOGARITHMIC SCALES FOR THE SHORT TIME RATES AND FOR THEIR SEASONALS ARE IDENTICAL. THE BOND YIELD DEVIATIONS' LOGARITHMIC SCALE IS TEN TIMES AS GREAT.

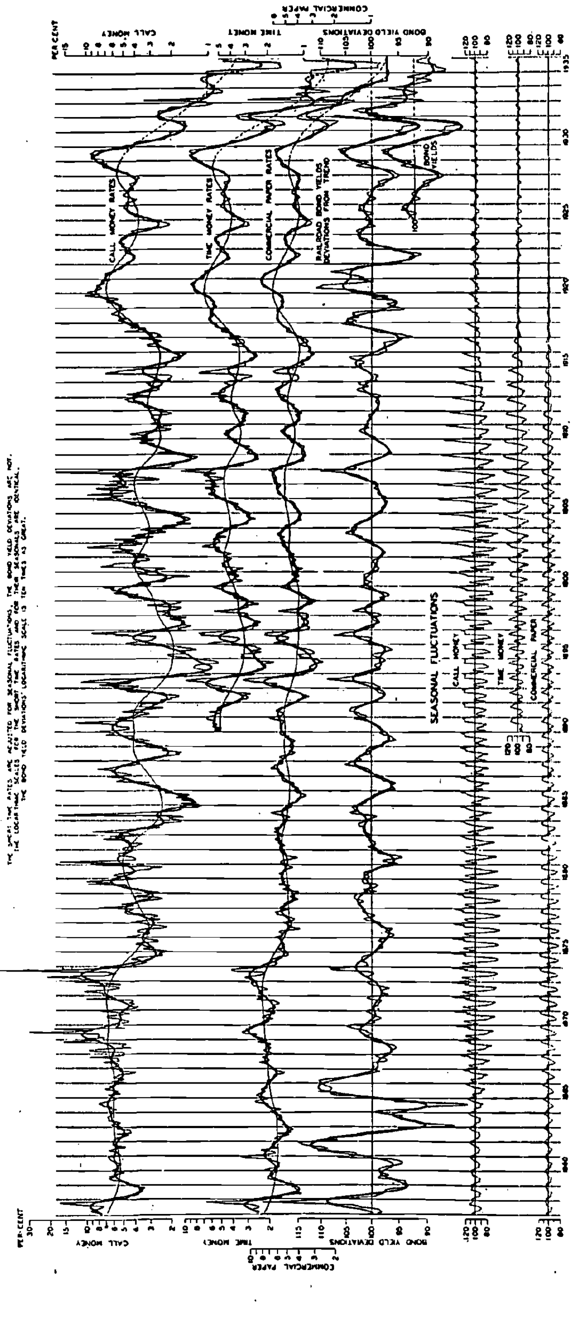

CHART 21

CYCLICAL MOVEMENTS OF INTEREST RATES AND OTHER ECONOMIC SERIES

THE CURVES BELOW ARE DEVIATIONS OF SEASONAL-ELIMINATING GRADUATIONS FROM CYCLE-ELIMINATING TREND LINES.
THEY THEREFORE REPRESENT SHORT TIME MOVEMENTS ONLY. SEE TEXT IN THIS CHAPTER.
THE DATA ARE LOGARITHMS AND THE UNITS ARE ROUGHLY PROPORTIONAL TO THE RESPECTIVE MEAN DEVIATIONS.

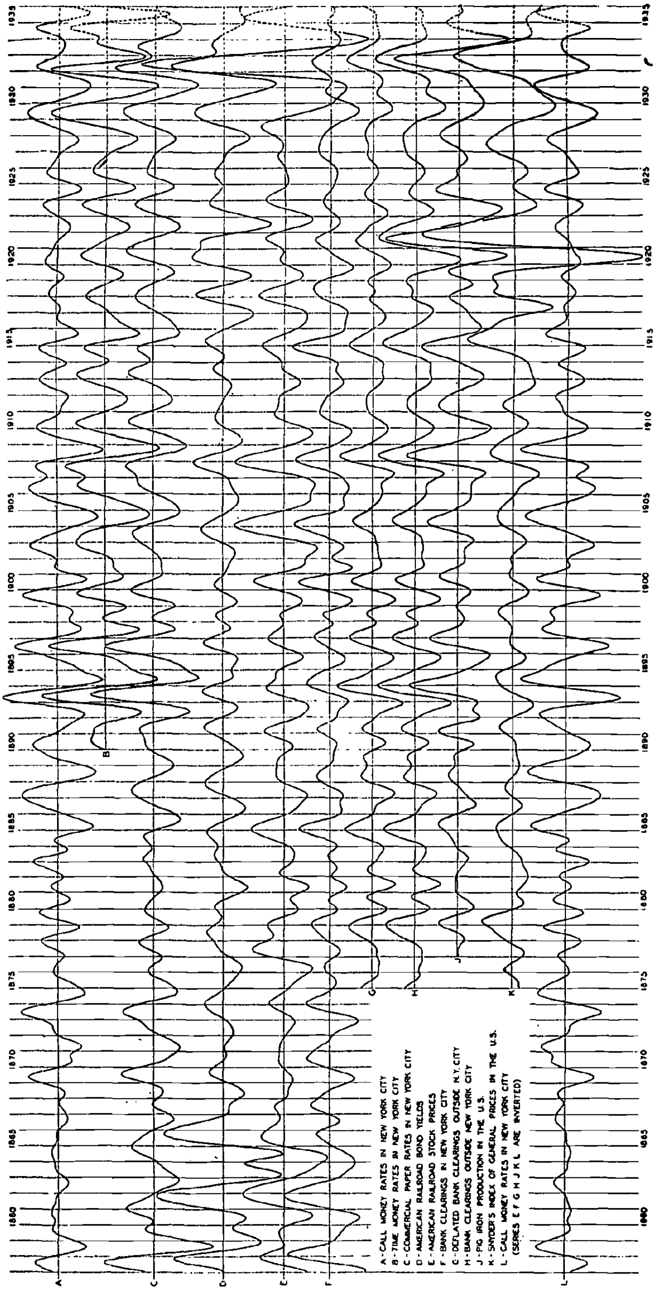

CHART 21

# CYCLICAL MOVEMENTS OF INTEREST RATES AND OTHER ECONOMIC SERIES

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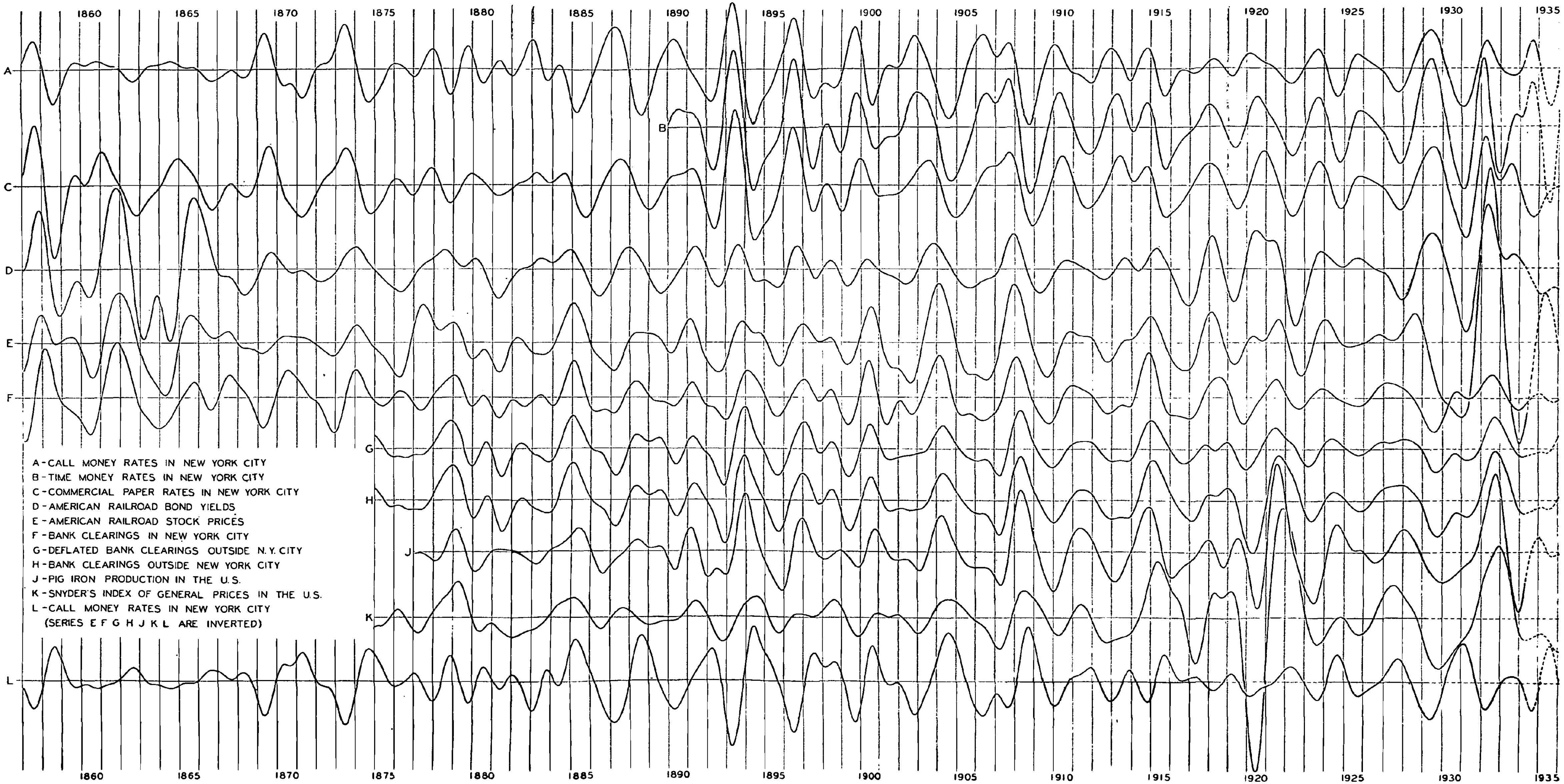


but closely related series. Any great degree of confidence in the 'accuracy' of any averages is entirely unwarranted. They may well be more misleading than enlightening.

Even series A, C, D and E (of Chart 21),[3] which are quite closely related, show many startling irregularities, as the reader may see if he will check up the following 'average' lags[4] with individual instances. The average lags in these four series run roughly[5] as follows. A high in call money rates precedes a high in commercial paper rates by about 2 months, a high in railroad bond yields by about 4 months and a *low*[6] in railroad stock prices by about 5 months. A high in commercial paper rates precedes a high in bond yields by about 2 months and a *low* in stock prices by about 3 months. A high in bond yields precedes a *low* in railroad stock prices by about 1 month. The lows do not show the same set of lags. A low in call money rates precedes a low in [7] commercial paper rates by about 2 months, but a low in bond yields by about 6 months and a *high* in stock prices by about 9 months. A low in commercial paper rates precedes a low in bond yields by about 4 months and a *high* in railroad stock prices by about 7 months. A low in bond yields precedes a *high* in stock prices by about 3 months.

The characteristics of the various lags are clear on Chart 21, which presents the cyclical movements of ten of the most important series presented in this book:

A Call money rates, January 1857 to January 1936
B Time money rates, January 1890 to January 1936
C Commercial paper rates, January 1857 to January 1936
D Railroad bond yields ('lowered' index), January 1857 to January 1936
E Railroad stock prices, January 1857 to January 1936
F Bank clearings in New York City, January 1857 to January 1936
G *Deflated* bank clearings outside New York City, January 1875 to January 1936

[3] Series B—time money rates—is here omitted because it has been used only as far back as January 1890.

[4] The condition is only slightly improved if the long period from January 1857 to January 1936 be broken up into shorter periods. Moreover, where improvement is possible it is often artificial and unreal—resulting from fitting to too few cases.

[5] Greater 'accuracy' than here presented is merely misleading.

[6] On the chart, series E is inverted. We are discussing it as though it were not inverted.

H Bank clearings outside New York City, January 1875 to January 1936

I Pig iron production in the United States, January 1877 to January 1936

J Carl Snyder's index of general prices, January 1875 to January 1936

K Call money rates, January 1857 to January 1936

Series E to K inclusive are inverted on the chart. The relations among the various series stand out sharply. Indeed, the reader may, as we have already said, easily be tempted to believe the regularity of movements and sequences greater than it really is. While the first three series (call money, time money and commercial paper rates) are very closely related, even here the lags are less uniform than a cursory inspection of the chart might lead one to suppose. For example, while commercial paper maxima on the graduations tend to occur about two months later than call money maxima, the range is all the way from two months earlier to ten months later. Similarly, while the commercial paper minima tend to occur about two months later than the call money minima, the range is from two months earlier to eight months later. A similar analysis of series that are less closely related shows even less regularity of movements and lags. The technical reasons for this condition are traceable not merely to the fact that the amounts of lag between definite maxima or minima, which on the chart appear unmistakably related, vary considerably, but also to the fact that it often is rather difficult to say just which maxima or minima should be considered together. The actual number of maxima or minima is not the same for each series. Call money rates have more maxima and minima, and hence more 'cycles', than railroad bond yields. Sometimes we have no actual maximum or minimum but do have a distinct pair of 'points of inflexion'. Shall these be used as though they contained a maximum or minimum point (we have not done so), and if so, what procedure should be followed to date such a point? Sometimes a maximum or minimum that appears distinctly on one series appears on another series as only a 'bulge' between two points of inflexion. In still other series it may not appear at all. For example, the minor maximum in call money rates in 1901 is suggested in time money, absent in commercial paper and railroad bond yields, suggested in railroad stock prices, clear cut in New York bank clearings, absent in deflated bank clearings outside New York, suggested in undeflated bank clearings outside New York, present in pig iron production and clear cut in Snyder's index of general prices.[7] The reader can easily spot similar and even more startling irregularities. Interesting and instructive as Chart 21 may be, to discuss its mere graphic peculiarities in any lengthy manner seems unnecessary. It speaks for itself.

However, there is one series whose order in the chart may disturb the reader—bank clearings in New York City. In general the order of movement of the series, as presented in the chart, is:

(1) Short time interest rates *decline.*
(2) Long time interest rates *decline.*
(3) Stock prices *advance.*
(4) Physical volume of business *advances.*
(5) Monetary volume of business *advances.*
(6) Commodity prices *advance.*
(7) Short time interest rates *advance,* etc.

Now bank clearings in New York City move earlier than the physical volume of business as represented by such series as *deflated* bank clearings outside New York City or pig iron production. The reason for this condition may be found in the fact that such a large percentage of the New York clearings are of a financial origin—tied up with groups 1, 2 and 3 above. The volume-of-business series that contain the price element move later than *truly corresponding* series that do not contain it. This is illustrated by bank clearings outside New York City—deflated and undeflated. Finally, we must remember that all the sequences may be reversed. This is illustrated by call money which is presented as the top of the chart and also as the bottom line—in the latter case inverted.[8]

The reader who wishes to examine the actual series rather than the graduations may do so in other charts and in the tables in Appendix A. After all is said and done, the graduations are intended merely to make the interpretation of the series easier, not to replace them. The

[7] At the end of 1901.

[8] Our method of deciding which sequence was best for graphic presentation has already been described. It was based on the two considerations of length of lag and contour of the graphs. Similarity of contour would suggest that the sequence was more important when so lagged than when lagged in an opposite sense.

raw data for the first three graduations of Chart 21 (call money, time money and commercial paper) may be examined in Chart 20. On that chart are presented the raw data (after adjustment for seasonal fluctuation), and 'cyclical' and 'trend' graduations; also the deviations of the data and of the 'cyclical' graduation of bond yields from the 'trend' graduation of the same series. The seasonal fluctuations of the three short term rates are presented at the bottom of the chart.[9]

The raw data for the fourth and the fifth graduations presented in Chart 21 (railroad bond yields and railroad stock prices) are presented in Chart 14, which gives, for each series, the raw data and the 'cyclical' graduation. The figures are given in Appendix A, Table 10, Columns 5 and 6.

The raw data for the fourth, sixth, seventh, eighth and ninth graduations of Chart 21 (railroad bond yields, bank clearings in New York City, deflated bank clearings outside New York City, undeflated bank clearings outside New York City, and pig iron production) are presented in Charts 22, 23 and 24.[10] Chart 23 gives each of these series in the form of the data and their 'cyclical' graduation. Mathematical curves fitted to deflated bank clearings outside New York City and pig iron production are given to illustrate how well the 'trends' of such series may be represented by ordinary mathematical equations (see Chart 22 and Chart 23). Chart 24 presents (for deflated bank clearings outside New York and pig iron production) the deviations of the data and of the 'cyclical' graduations from such fitted mathematical curves. This chart also presents railroad bond yields in the form of (1) the raw data, (2) the 'cyclical' graduation, (3) the 'trend' graduation, (4) the deviations of raw data and of the 'cyclical' graduation, from the 'trend' graduation. The reader will find it interesting and instructive to compare the deviations of deflated bank clear-

[9] The figures for call money, time money and commercial paper rates, unadjusted for seasonal fluctuations, are given in Table 10 in Appendix A. Graduations and seasonals for these series are presented in Tables 21, 22 and 23.

[10] The figures for bank clearings in New York City, deflated bank clearings outside New York City, (undeflated) bank clearings outside New York City, pig iron production and wholesale prices, unadjusted for seasonal fluctations, are given in Appendix A, Table 27. The graduations and seasonals of these series are presented in Appendix A as follows: bank clearings in New York City, Table 28; (undeflated) bank clearings outside New York City, Table 29; deflated bank clearings outside New York City, Table 30; pig iron production, Table 31; wholesale prices, Table 32.

ings outside New York and of pig iron production from the fitted mathematical curves with the deviations of the same series from the 'trend graduations' (presented in Chart 21).

The raw data for Mr. Carl Snyder's index of general prices—the tenth graduation of Chart 21—are not shown on any chart presented in this book. The figures are given in Appendix A, Table 27. Monthly data (January 1890 to January 1936) for the United States

CHART 22

BOND YIELDS AND THE VOLUME OF BUSINESS

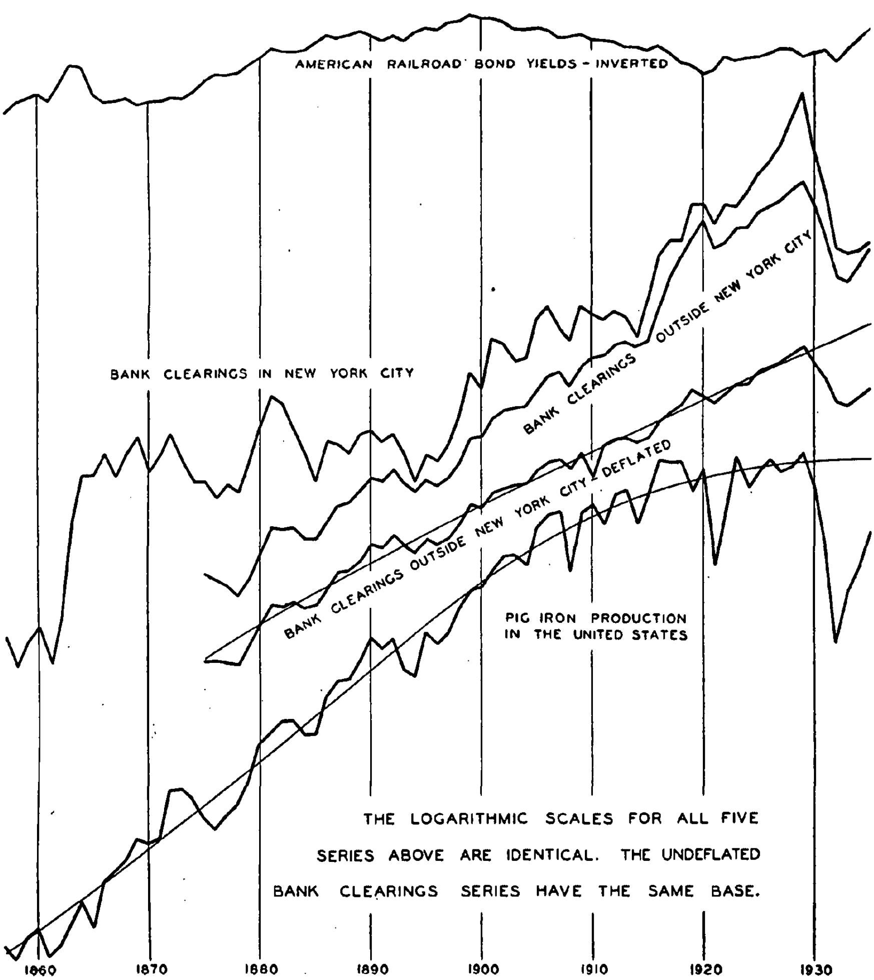


CHART 23
BOND YIELDS AND THE MONETARY AND PHYSICAL VOLUME OF BUSINESS
(LOGARITHMIC SCALES)

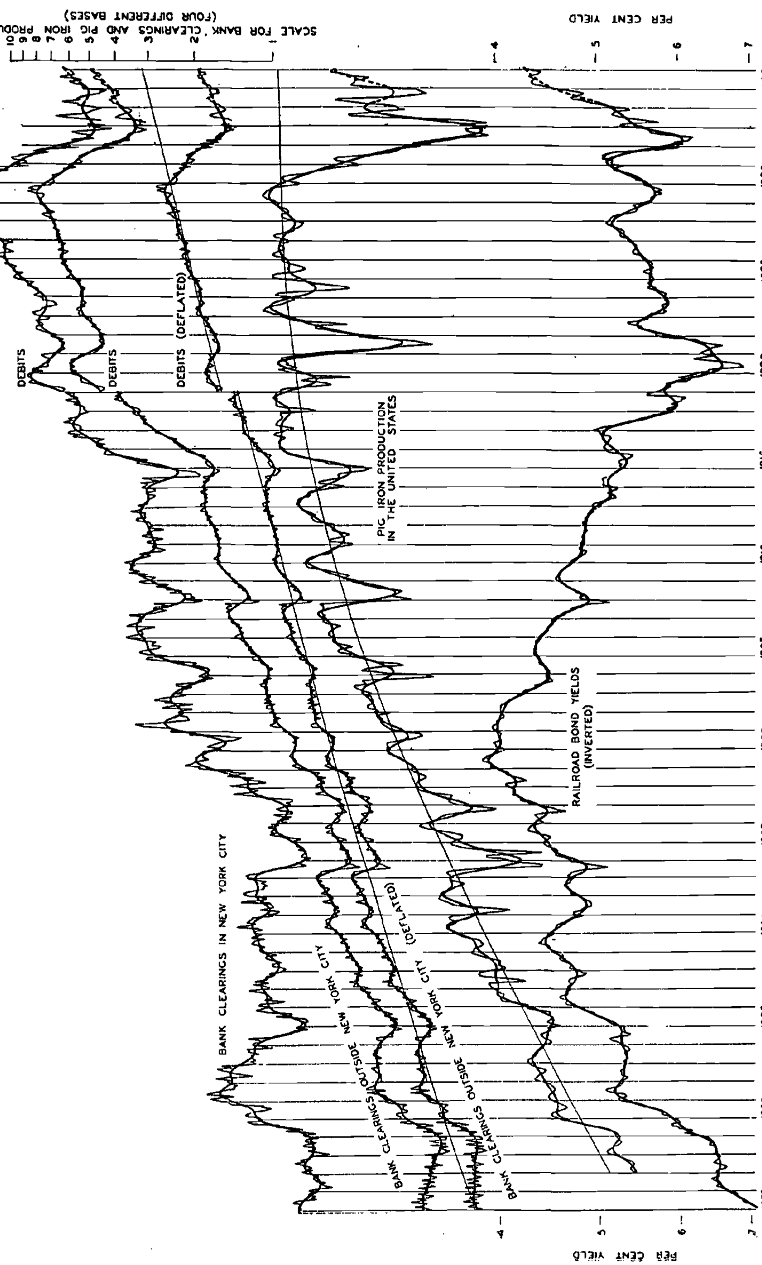


CHART 23

# BOND YIELDS AND THE MONETARY AND PHYSICAL VOLUME OF BUSINESS

(LOGARITHMIC SCALES)

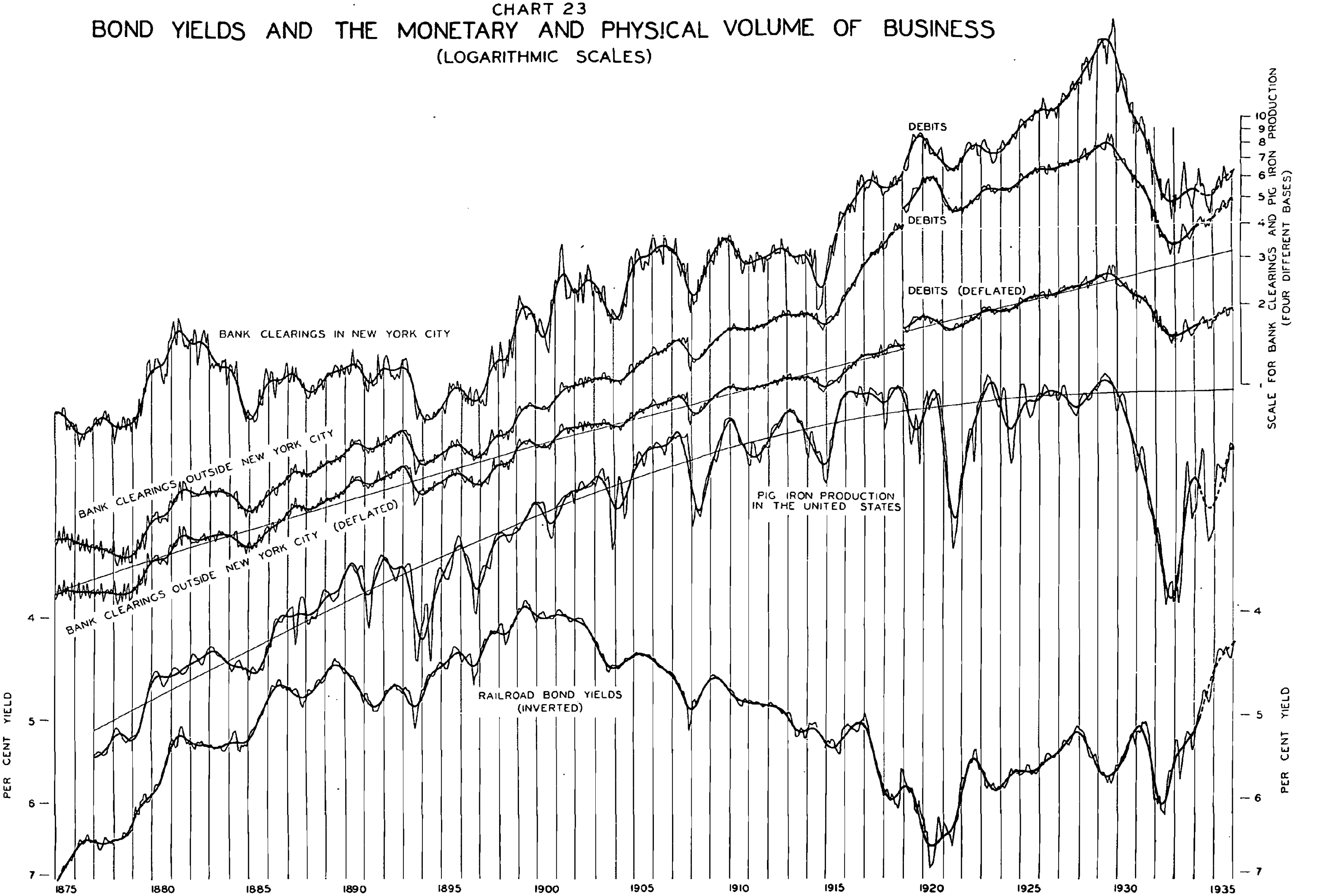
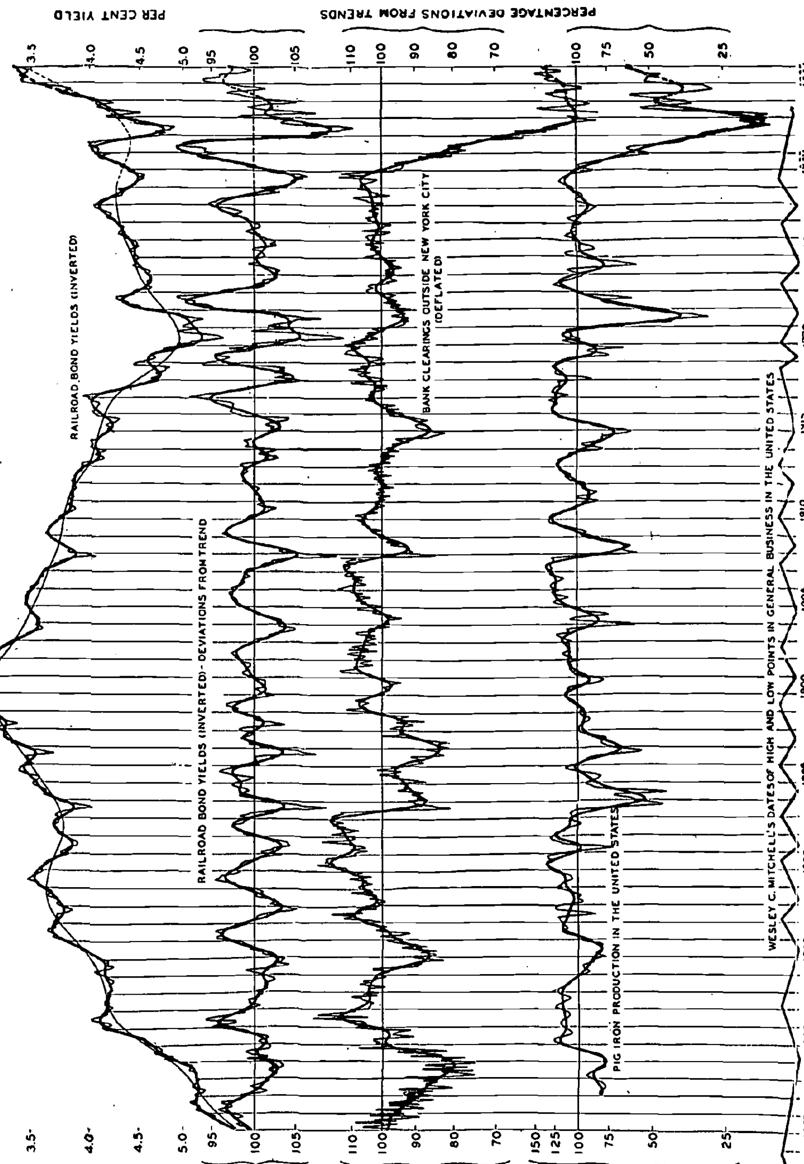


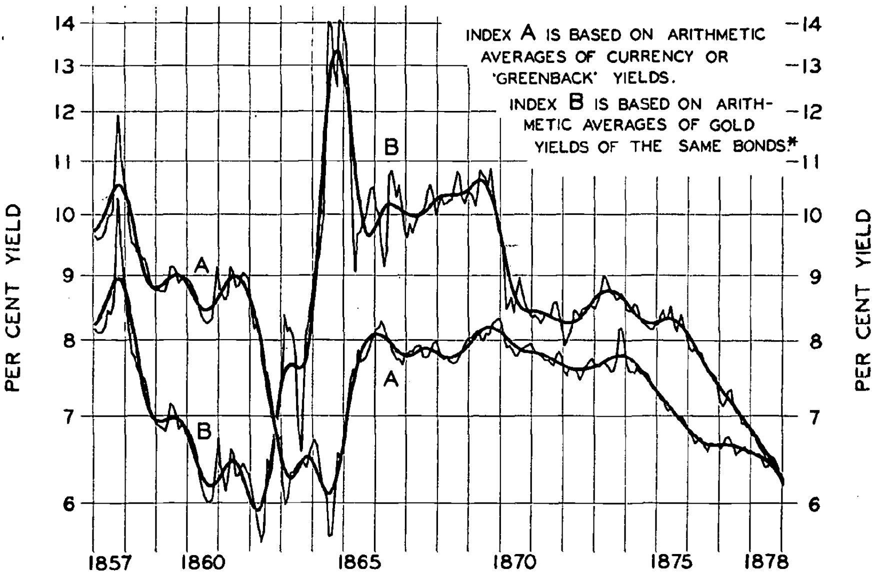
CHART 24
BOND YIELDS AND THE PHYSICAL VOLUME OF BUSINESS
(LOGARITHMIC SCALES)



Bureau of Labor Statistics index of the price of commodities at wholesale are compared with bond yields in Chart 18—the data and the 'cyclical' graduation being given for each series.

The reader who is interested in the distortions that are introduced

CHART 25
AMERICAN RAILROAD BOND YIELDS
JANUARY 1857 TO JANUARY 1879




*SEE TEXT

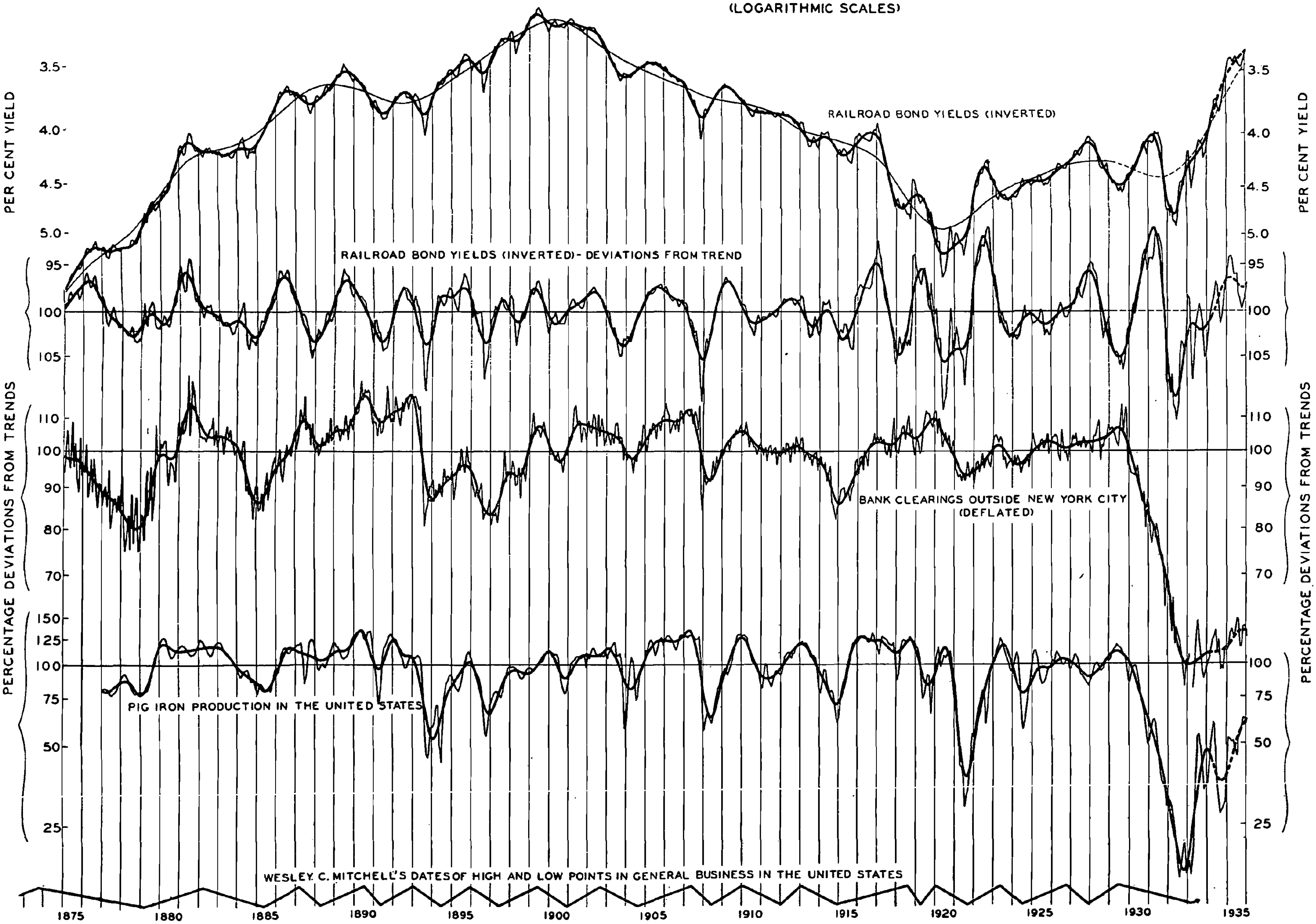
into some of the series by the paper inflation of 1862 to 1879 may examine Charts 25, 26, 27 and 28. An examination of these charts, together with the charts showing purely 'paper' data, will also illustrate how deceptive mere graphic appearances of lead and lag or correlation in general may sometimes be.

Such is the thorny path that must be trod by the professional 'forecaster'. He cannot operate on what the sequences and lags should be; he must operate on what they actually are—indefinite as a statement of that condition may be. He is interested in noting that a rise in short term interest rates or commodity prices so often precedes a rise in bond yields. He is very unlikely to be interested in hearing that if the future of short term interest rates or commodity prices were definitely known, the sequences might be different. However, such

CHART 24

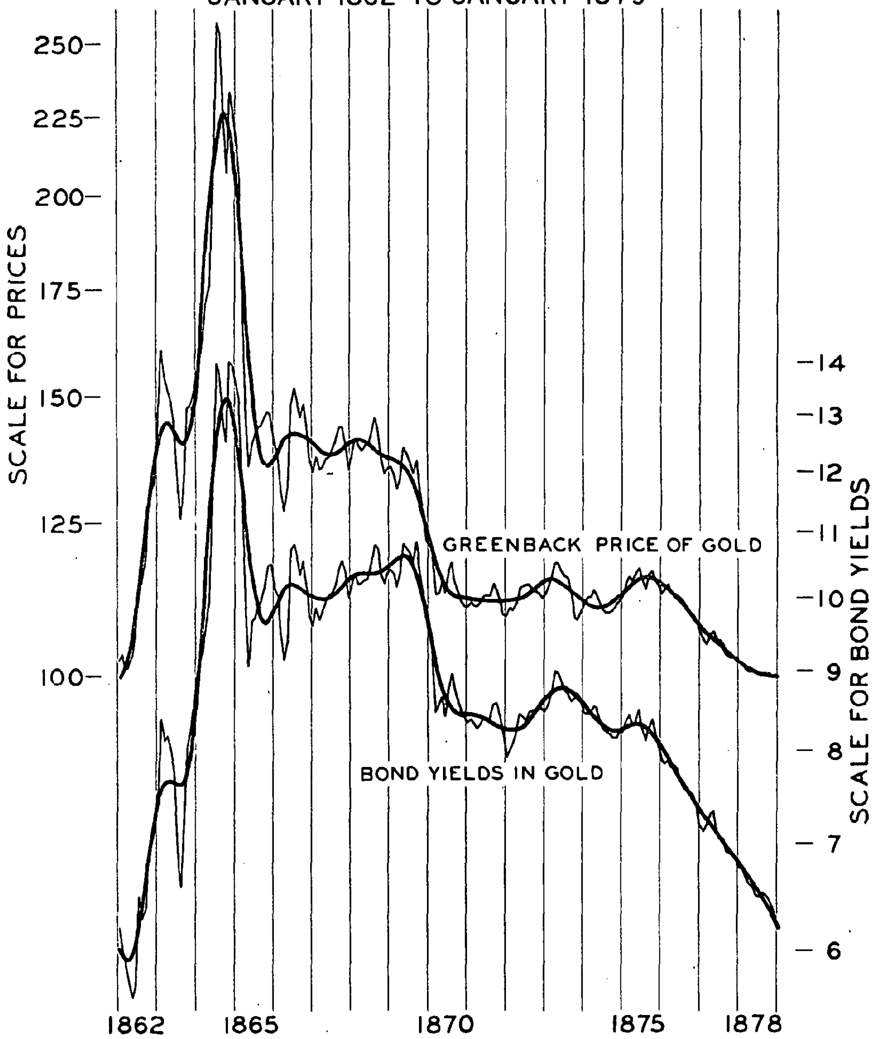
# BOND YIELDS AND THE PHYSICAL VOLUME OF BUSINESS

(LOGARITHMIC SCALES)



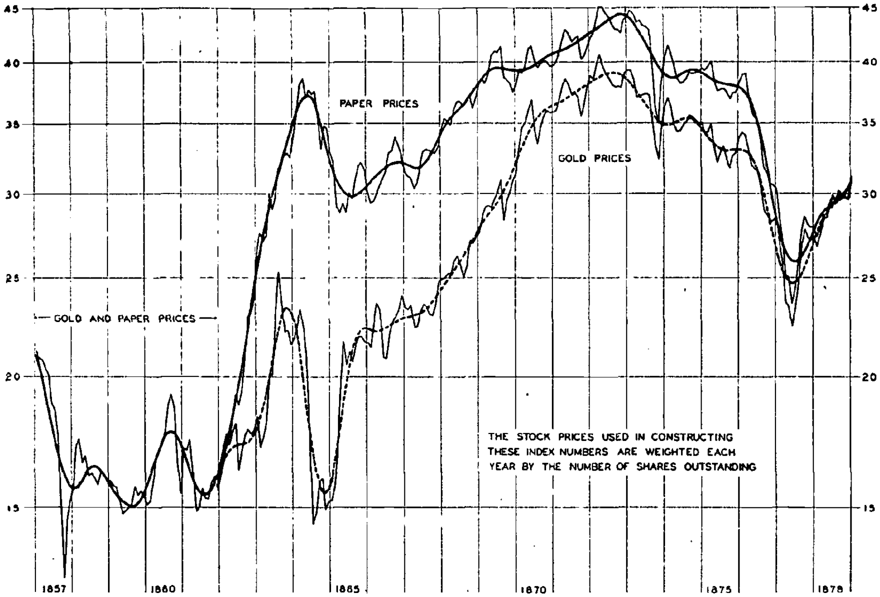
knowledge might well be of some use to him. It would be well if he always remembered that the various sequences are as they are largely because of the inadequacies of human intelligence rather than because of its triumphs. For example, in a period when general forecasting

CHART 26
GOLD YIELDS OF AMERICAN RAILROAD BONDS AND THE PRICE OF GOLD IN GREENBACKS
JANUARY 1862 TO JANUARY 1879



happens to be unexpectedly good the usual sequences will tend to be less rather than more reliable as indicators of the future. Economic forecasting that is based on 'leads' and 'lags' is almost necessarily extremely dangerous—though it often is almost the only way to handle

CHART 27
GOLD AND PAPER PRICES OF AMERICAN RAILROAD STOCKS MONTHLY
JANUARY 1857 TO JANUARY 1879




the problem. In attempting to forecast such a series as stock prices the professional 'forecaster' commonly assumes the continuation of illogical relations between it and certain other series, and attempts to predict the future of the latter—although if their future were really known the existing illogical relations would not continue. The forecasting of the future of the 'other' series is very often attempted by means of implicit assumptions concerning the timing of a reversal in their cyclical movements, the timing of this reversal being itself dependent on assumptions concerning regularity of amplitude in the 'swing' of these 'other' series. In such methods an extremely bad condition is assumed to be a good sign, and *vice versa.* The injunction to 'buy stocks when the percentage of pig iron furnaces in blast falls *below* sixty'—not when the percentage is *more* than sixty but when

CHART 28

INTEREST RATES AND SECURITY PRICES IN THE UNITED STATES

JANUARY 1857 TO JANUARY 1879

(IDENTICAL LOGARITHMIC SCALES)

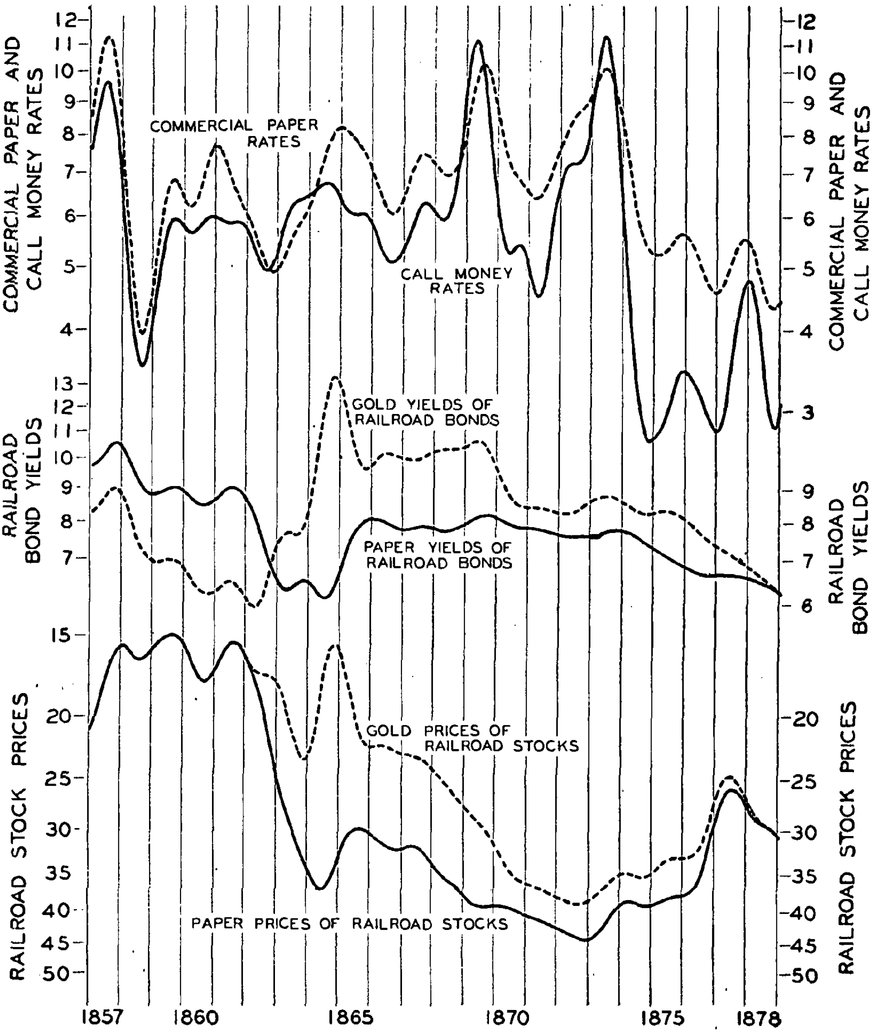
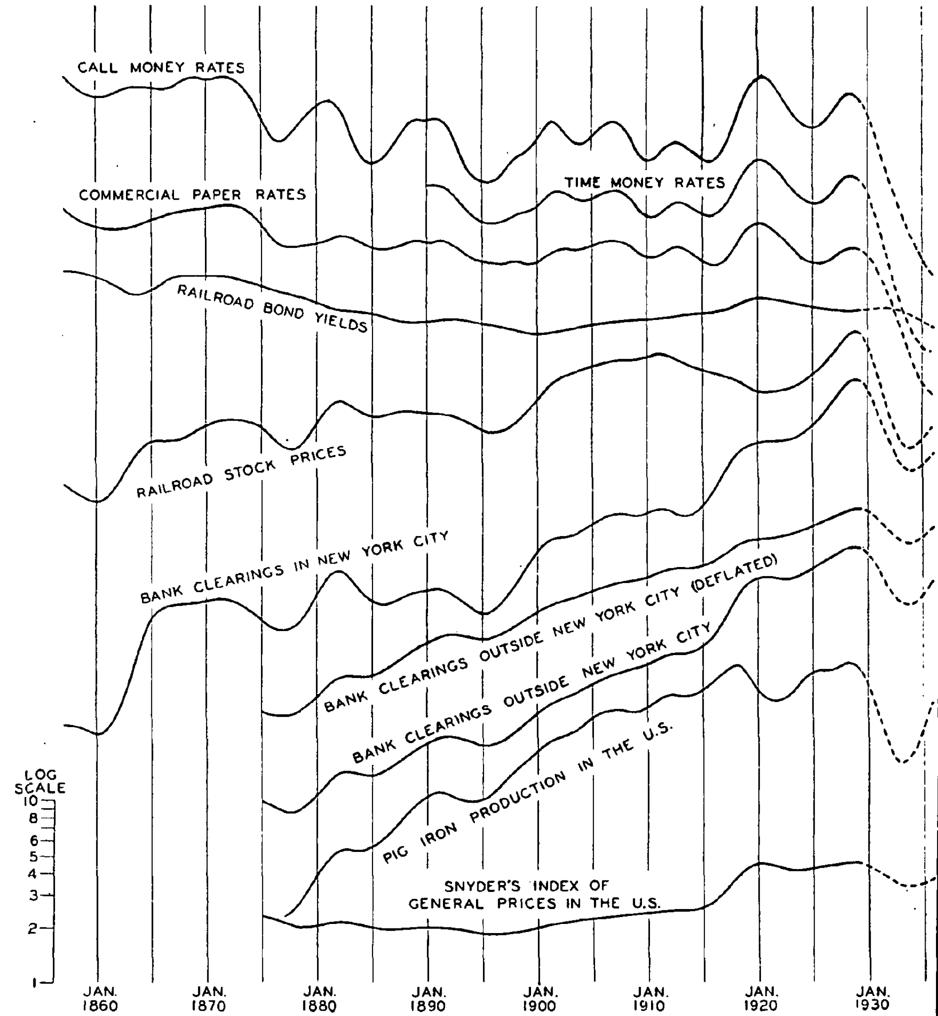


CHART 29

LONG TIME MOVEMENTS OF THE VARIOUS SERIES AS SHOWN BY CYCLE-ELIMINATING TREND LINES

(IDENTICAL LOGARITHMIC SCALES)



it is *less*—involves the assumption that when the iron industry reaches a specified degree of *badness,* the outlook for general business (including the iron industry, of course) is, or at least in the near future will be, good. Other indices of the activity of business are used in a similar manner. When business is sufficiently bad, buy stocks; when it is sufficiently good, sell them. Even instructions such as 'sell stocks when commercial paper rates rise to 4½ per cent', or 'sell stocks when commercial paper rates have risen 1¼ per cent', are not given primarily because of any belief that such conditions will *cause* a decline in business but simply because such a movement of rates is considered a symptom—a good indication—that business has advanced far enough to be approaching the region of reversal. The chief proponent of the 1¼ per cent rise rule adds 'when business activity is increasing'.

However, the study of relations among economic series is at least more promising than the attempt to develop rigid cyclical formulas on the basis of one or more individual series. The 'lags' of the various series are less irregular than their cycle lengths though even here we find anything but mathematical regularity. The irregularities seem traceable to two causes. In the first place the relationship between any two series is seldom self-contained. Movements of pig iron production are not determined by movements of general commodity prices alone. In the second place, in so far as logical relations should exist, as between long and short term interest rates, the logical adjustment of the one series to the other so often requires more than a mere knowledge of the past and present. Logically, as we have shown, long term interest rates should be adjusted to future short term rates. But this is quite impossible not only because the future is not known but also because, in the stress of deflation, it could not be acted on if it were known.[11]

Few economic series are like long and short term interest rates, which logically would depend on one another alone, unaffected by what happens to all other series. The reason in this case is, as we have

[11] This would not be strictly true in a hypothetical society where all was known. In such a society 'deflation' would not occur. However, this merely illustrates that the economic cycle is a phenomenon of a society in which all is not known. Of course, the hypothesis of a society where 'all is known' becomes a metaphysical concept hardly to be distinguished from the nineteenth century mechanistic philosophy which would suggest that if, at the birth of Christ, the exact position and motion of every atom in the universe were known to a sufficiently skillful mathematician, he could have stated that beer would come back to America in April 1933.

seen in Chapter II, that logically they are the same thing. The relation would be what the logicians term an 'essential' relation. Long term interest rates would be absolutely rigidly related to short term rates because they would be an average of a particular form of future short term rates. They would be related to short term rates in much the same manner as an index number of commodity prices is related to the prices of the individual commodities.

To the extent that adjustment requires a knowledge of the future, economic relations tend to depart from what they logically would be. 'Present' adjustments, such as those concerned with the making in a market of a price for a perishable consumers' good, may approach a rational norm similar to that presented by the more rigid and arithmetic of the members of the Austrian school, for example, Philip H. Wicksteed, but adjustments involving forecasts of the future cannot do so.

In our discussion of the relation of bond yields to short term interest rates and to commodity prices we drew attention to the inadequacy of adjustments requiring knowledge of the future. The relation of bond yields to the general level of profits and to changes in the monetary and physical volume of business—the 'other' series that we present and discuss in this volume—is of a similar type. To be at all adequate as an adjustment, the relation would necessitate a complete knowledge of all the relevant future. Indeed knowledge of the future is, in each of these relations, the fundamental requirement. In the case of business profits this is immediately apparent. After correction for the element of risk, *future* profits (if they could be adequately forecast) would be a factor to which bond yields would have to adjust themselves. Fluctuations in the monetary volume of business do not appear to be so directly related to bond yields unless we remember their usual close relation to profits. Periods of high volume (physical or monetary) of production are usually periods of high rates of profit. Enforced liquidation may cause a sudden spurt in the monetary volume of trade and even stimulate production, undertaken to convert inventories into more salable products, but spurts due to enforced liquidation seldom last long. In general, both the physical and monetary volume of business is large when an increased demand has brought about an increased output, then a rise in prices followed by a further increase in output. Usually the price rise remains or even continues while the output is increasing. An increased physical volume without any increase in the monetary volume can occur only when prices have been falling. This would be most likely to occur in the very early stages of a revival. However, the increased physical volume could not be great or it would lead to an increased monetary volume. Absolute figures (not deviations from trends) of monetary volume would, of course, be more closely related to monetary profit levels than would absolute figures of physical volume.

The relations of the larger deviations from long term trends (so-called cycles) would, under a condition of complete and adequate adjustment (on the assumption of complete knowledge of the future), be of almost the same kind as if there were no trends, because, if one series were adjusted to future values of the other, this adjustment could be broken down into two components: one an adjustment to the future trend and the other an adjustment to the 'cycles', or better say, the major deviations from the trends. Now the adjustment to the future trend would tend to have the same sort of long term 'sweep' that all trends have. Because the trend of the independent variable is a trend—in other words, changes its level and direction only very slowly—the dependent variable will do likewise. On the other hand, of course, when the theoretical adjustment is such that the dependent variable is merely a first derived function of the independent variable—as it would be if call money were absolutely determined by the monetary *rate* of change in commodity prices—the curve tracing the course of the dependent variable would not have the clear-cut 'trend' characteristics of the independent variable. However, not only would we not expect—even under the hypothesis of complete knowledge of the future—call money to be related to commodity price movements in this manner, but even if it were, the movements of time money, and still more those of long term bond yields, would, so far as they were dependent on the trend of commodity prices, have themselves almost as much of the 'sweep' and 'trend' characteristics as would the commodity prices. If the duration of a bond were long enough, the 'trend' of the yield would, under the assumption of complete adjustment to the future trend of commodity prices, show an even more pronounced 'sweep' than the commodity price trend itself.

But, leaving these discussions of how things would occur if the future were known and if that knowledge were rationally used, we must emphasize that all the relations among the various series tend to be of the same illogical, or at least non-logical, nature we have already found to exist in the actual relations between bond yields and short term interest rates and commodity prices. Moreover, as we have attempted to explain in Chapter I, the relations are not uniform, for they are always affected more or less by good or bad forecasting. They are a composite of, the results of past and present facts, and forecasts of the future. Because the forecasts vary with respect to not only their goodness but also the importance of their effect as compared with past and present facts, the series show only a very moderate degree of uniformity in their relations from year to year and from decade to decade. In a period of prosperity the influence of forecasting (of further prosperity or even of a termination of prosperity) is more important as compared with the influence on past or present facts than in a period of depression or crisis. As we have already noted, when selling is 'forced' the element of forecast becomes quite negligible.

With the growth of knowledge the accuracy of forecasting will increase but this can bring about a pronounced decrease in the violence of economic disturbances only if it entails something more than mere 'speculative' forecasting. It must lead to a change in those present conditions that tend to produce untoward future results. In a period of over-rapid credit expansion it is not enough to foresee that when such expansion can go no further a collapse of prices will begin. It is not sufficient to sell securities and commodities or even sell them short in preparation for such a collapse. It is necessary to check the credit expansion. We must make the future and not merely foresee it. And that can be done only in the present. Mere knowledge is not sufficient. It can never be complete and it will always be human nature to gamble on whether if one buys at an inflated level he will be able to find a bigger fool than himself to buy from him at a still higher level. The primary reason for the variableness of the economic future to which man must adjust himself lies in man himself. Without knowing what the future effects of his present acts will be, and often apparently caring less, he proceeds to *make* a future to which he will find he cannot adjust himself.

It would, of course, be absurd for the *individual* speculator or entrepreneur to base his business operations naively and completely on an attempted analysis of how the social present *should* be adjusted to the social future. If we have demonstrated anything in this book, it is that economic phenomena are, in fact, only accidentally so related. But it is strange indeed that economic theorists should so seldom have hinted at, let alone analyzed, the *social* import of the opposition of the logical and actual sequences. That present conditions, if they are not to contain the seeds of future disturbance, must be adjusted to future conditions would seem plain and obvious. But perhaps it is too plain. The very insolence of the obvious can easily prevent its being noticed. And, even if noticed, its significance can all too easily be missed.